RECORD OF DECISION

Operable Unit 5 and
Amendment to Operable Unit 3 Selected Remedy

Roebling Steel Superfund Site

Florence Township, Burlington County, New Jersey

United States Environmental Protection Agency

Region II

September 2003

DECLARATION STATEMENT

SITE NAME AND LOCATION

Roebling Steel Company Site (EPA ID# NJD073732257)
Florence Township, Burlington County, New Jersey
Operable Unit 5 (OU5) and Amendment to Operable Unit 3 (OU3) Remedy

STATEMENT OF BASIS AND PURPOSE

This decision document presents the OU5 Selected Remedy for soil, sediment and groundwater contamination, and amends the 1991 OU3 Remedy for the Slag Area. The Selected Remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act, as amended, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan. This decision is based on the Administrative Record file for the site.

The State of New Jersey concurs with the OU5 Selected Remedy and the Amendment to the OU3 Remedy. A copy of the related concurrence letter can be found in Appendix IV. The information supporting this remedy is contained in the Administrative Record for this site, the index of which can be found in Appendix III.

ASSESSMENT OF THE SITE

The response actions selected in this Record of Decision (ROD) are necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances from the site into the environment.

DESCRIPTION OF THE SELECTED REMEDY

This is the fifth remedial phase, or operable unit, and fourth ROD for the Roebling site. The major components of the OU5 Selected Remedy, which takes into consideration the amendment of the OU3 Remedy, include:

Soils

- Capping of site-wide contaminated soil, including the Slag Area. Two distinct capping options are considered based on the physical characteristics of different portions of the site, and the current and potential future uses of each portion, Option (a) soil/asphalt, and Option (b) soil only;

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The cap will support a stormwater management system and erosion controls along the shoreline;

- Implementation of a long-term maintenance and monitoring program to ensure the integrity of the capped areas; and,

- Institutional controls to restrict future excavations through the soil cap and limit future land uses.

Sediments

- Dredging of the contaminated sediments found in the Delaware River and Crafts Creek;

- Dewatering and capping of the dredged sediments on-site; and,

- Backfill by placement of a sandy loam soil with organic matter and restoration of dredged areas by re-establishing wetlands.

Groundwater

- Implementation of a long-term groundwater sampling and analysis program to monitor the contaminant concentrations in the groundwater at the site, to assess the migration and attenuation of these contaminants in the groundwater over time; and,

- Institutional controls to restrict the installation of wells and the use of contaminated groundwater in the vicinity of the site.

DECLARATION OF STATUTORY DETERMINATIONS

Part 1: Statutory Requirements

The Selected Remedy is protective of human health and the environment, complies to the extent practicable with federal and State requirements that are applicable or relevant and appropriate (ARARs) to the remedial action, and is cost-effective. The Selected Remedy for the soils, sediments and groundwater components utilize permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable. In addition, EPA is invoking an ARAR waiver due to technical impracticability for groundwater at the site since groundwater remediation in the overburden aquifer is not practicable from an engineering perspective.

Part 2: Statutory Preference for Treatment

The Selected Remedy does not satisfy the statutory preference for treatment as a principal element since the selected soil remedy component requires capping the contaminated soils and slag in place, and utilizing institutional controls to prevent exposure to the contaminated soils and slag. For sediments, the Selected Remedy component requires dredging contaminated sediments, dewatering the sediments and placing them on site below the soil cap, and utilizing institutional controls to prevent exposure. Also, the selected groundwater remedy component does not satisfy the statutory preference for treatment as a principal element since it utilizes institutional controls to monitor the levels of contamination in groundwater and any potential migration. ARARs are not expected to be achieved; therefore, EPA is invoking a technical impracticability waiver.

However, the principal threats posed by the site consist mainly of waste products and materials from the steel manufacturing process that have contaminated the soils, sediments and groundwater. Many of these principal threats were addressed during removal actions at the site or earlier site Operable Unit Records of Decision. The previous three RODs, signed in 1990, 1991, and 1996, selected remedies that address the principal threat source materials including: removal of drums, transformers, tanks, a baghouse dust pile, chemical piles, and tires; removal of contaminated surface soils from two adjacent parks; and remediation of 70 abandoned buildings which contain contaminated process dust, friable asbestos, contaminated equipment, tanks, pits and sumps, and underground piping systems. Remaining principal threat sources of contamination, also referred to as areas of concern (AOCs), will be remediated as part of the OU4 building cleanup.

Part 3: Five-Year Review Requirements

Because the Selected Remedy will result in hazardous substances, pollutants, or contaminants remaining on the site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of the remedial actions to ensure that the Selected Remedy is, or will be, protective of human health and the environment.

ROD DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record file for this site.

- Chemicals of concern and their respective concentrations may be found in the "Site Characteristics" section.
- Baseline risk represented by the chemicals of concern may be found in the "Summary of Site Risks" section.
- A discussion of cleanup levels for chemicals of concern may be found in the "Remedial Action Objectives" section.
- A discussion of source materials constituting principal threats may be found in the "Principal Threat Waste" section.
- Current and reasonably anticipated future land use assumptions are discussed in the "Current and Potential Future Site and Resource Uses" section.
- A discussion of potential land use that will be available at the site as a result of the Selected Remedy is included in the "Remedial Action Objectives" section.
- Estimated capital, annual operation and maintenance (O&M), and total present worth costs are discussed in the "Description of Alternatives" section.
- Key factors that led to selecting the remedy (i.e., how the Selected Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decisions) may be found in the "Comparative Analysis of Alternatives" and "Statutory Determinations" sections.

Jane M. Kenny
Regional Administrator
Region II

9/30/03
Date

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RECORD OF DECISION FACT SHEET
EPA REGION II

Site:

Site name: Roebling Steel Site

Site location: Florence Township, Burlington County, New Jersey

HRS score: 41.02

Listed on the NPL: September 8, 1983

Record of Decision:

Date signed: September 30, 2003

Selected Remedy:

Soil Alternative 3: Capping, Stormwater Management and Erosion Controls, including the Slag Area (Soil/Asphalt Cap is referred to as Option A and a Soil Cap is referred to as Option B)

Sediment Alternative 5: Dredging, On-site Disposal, and Restoration

Groundwater Alternative 2: Long-term monitoring and Institutional Controls

Capital cost:

Soil Alternative 3 (including the Slag Area)	$20,092,000 (Option A) $16,839,000 (Option B)
Sediment Alternative 5	$11,354,000
Groundwater Alternative 2	$15,000

Anticipated Construction Completion: September 2007

O & M cost:

Soil Alternative 3 (including the Slag Area)	$212,000 (Option A) $178,000 (Option B)
Sediment Alternative 5	$0
Groundwater Alternative 2	$50,000

Present-worth cost:

Soil Alternative 3 (including the Slag Area)	$24,422,000 (Option A) $20,479,000 (Option B)
Sediment Alternative 5	$11,354,000
Groundwater Alternative 2	$686,000

Lead:

Site is currently fund lead: EPA is the lead agency

Primary Contact: Tamara Rossi, Remedial Project Manager, (212) 637-4368

Secondary Contact: Jeff Josephson, Team Leader, New Jersey Projects/State Coordination Team, (212) 637-4404

Waste:

Waste type: Primarily inorganics and semi-volatile organics

Waste origin: Steel Manufacturing Facility

Contaminated medium: Soil (including the Slag Area), Sediment, and Groundwater

DECISION SUMMARY

Operable Unit 5 and
Amendment to Operable Unit 3 Selected Remedy

Roebling Steel Superfund Site

Florence Township, Burlington County, New Jersey

United States Environmental Protection Agency

Region II

September 2003

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APPENDICES

SITE NAME, LOCATION, AND DESCRIPTION

The Roebling Steel Site (Site) is a 200-acre property bordered by Second Street and Hornberger Avenue in the Village of Roebling, Florence Township, Burlington County, New Jersey. Geographically, the Site is located at latitude 40° 07' 25" N and longitude 74° 46' 30" W (Bristol 7-1/2 minute USGS quadrangle map). The Site is bordered on the north and east by the Delaware River and Crafts Creek, respectively. A fence identifies the southern boundary of the Site. A Penn Central (Conrail) railroad track runs adjacent to the southeastern boundary of the Site. U.S. Route 130 is approximately one-half mile south of the site property, as shown in Figure 1.

Residential properties in the Village of Roebling are located to the west and southwest of the Site at a zoning density of approximately eight dwellings per acre. Most residential development adjacent to the Site was constructed by the steel plant operators and used to house plant employees. The nearest residences are approximately 100 feet away from the site property boundaries, 250 feet from the slag disposal area at the northwestern edge of the Site, and 1,200 feet from the wastewater treatment plant and sludge lagoons at the northeastern edge of the Site. Two public playgrounds, the Roebling Park and southeast playground, are adjacent to the Site. The residential area of Florence Township is one to two miles west of the Site. The remainder of the Township consists of farmlands, wetlands and forested areas, except for a few residential areas abutting roadways. The population of Florence Township is 10,746 (2000 census).

The Site is an inactive facility that was used from 1906 until 1982, primarily for the production of steel products. Steel production resulted in the generation of significant quantities of waste materials in both liquid and solid forms. The majority of liquid wastes were discharged to Crafts Creek and the Delaware River. Large quantities of solid wastes, including slag, mill scale, spent refractory materials, and other production residues, were disposed at the Site. Slag material was used to fill in a large portion of the bordering Delaware River shoreline. There were approximately 70 buildings, some quite large, on the main plant area of the Site; they are connected by a series of paved and unpaved access roads, as shown in Figure 2. Prior to remediation of the buildings, they contained contaminated process dust on the walls and floors, contaminated process equipment, tanks, pits and sumps, underground piping systems, and damaged friable asbestos.

The site topography is essentially flat, except for a hill on the southern boundary of the slag disposal area that rises to Riverside Avenue, a steep slope down to the banks of the Delaware River, and that portion of the slag area where crucible-shaped slag piles are present. The Site is situated between 15 and 35 feet above mean sea level (MSL), in the Delaware River drainage basin, and is mostly above the 100-year flood plain except for two portions of the slag disposal area.

The groundwater underlying the Site is at the margin of the Potomac-Raritan-Magothy aquifer, designated by the State of New Jersey as a Class 2A drinking water aquifer. The Village of Roebling and Florence Township obtain their potable water from public supply wells located about two miles west of the Site. The city of Burlington, approximately six miles downstream from the Site, obtains potable water from both the Delaware River and shallow groundwater wells. The groundwater flow of the upper and lower aquifers radiates out from the southwest corner of the Site and discharges directly into the Delaware River. At low tide, the Site discharges groundwater to the river, while at high tide the river acts to recharge the aquifer along certain sections of the shoreline. Some shallow groundwater also discharges to the Crafts Creek tidal channel/basin area.

The Delaware River, in the vicinity of the Site, is part of the freshwater portion of the estuary located in the Delaware River Basin Commission (DRBC) Water Quality Zone 2, between the head of tide at Trenton, New Jersey and Northeast Philadelphia, Pennsylvania. The Delaware River is used for contact (e.g., swimming) and non-contact (e.g., boating) recreational activities in the vicinity of the Site. This reach of the Delaware River is subjected to tidal influence, with the vertical tidal range measuring approximately eight feet at the Site. There are approximately 25 major municipal and industrial dischargers that are within one tidal excursion from the Site. The area adjacent to the Site is part of a five-mile stretch that does not support fishing; State-wide advisories have been issued on the consumption of certain fish.

The Roebling Steel Superfund Site (EPA ID# NJD073732257) is on EPA's National Priorities List (NPL). EPA is the lead agency for the site, and the New Jersey Department of Environmental Protection (NJDEP), is the support agency.

SITE HISTORY AND ENFORCEMENT ACTIVITIES

Historical Site Use

About the turn of the century, the John A. Roebling's Sons Company in Trenton, New Jersey, was expanding its operations. The Roebling family selected Kinkora, later known as Roebling, as the location of the new steel plant. The land was purchased, and riparian rights to fill in the river were obtained, so that as the plant required additional structures, there would be enough room for expansion, as shown in Figure 3. In 1904, construction of the steel plant began, with a Melt Shop, Blooming Mill, Rod Mills, Wire Mills, Cleaning Houses, Annealing and Tempering Shops, and a Woven Wire Fabrics Factory. In addition to the steel plant, a complete town for the workers, with a hospital, schools, shops, banks and theaters was built to house a population of approximately 4,000. Over time, buildings were constructed as needed, many on the slag fill. The sequence of structures at the Site was logically ordered to suit the various different process steps involved in the manufacturing of steel products.

The John A. Roebling's Sons Company owned and operated the steel wire manufacturing plant until its sale to Colorado Fuel & Iron Company, later known as CF&I Steel Corporation, (CF&I) in 1952. The Roebling name is synonymous in the United States with the manufacture of quality wire cable and rope used in the construction of major suspension bridges, manufacture of elevators, electric and telegraph transmission lines, and in the marine and airline industries. The surrounding Village of Roebling and the Main Gate Building at the original entrance to the plant have been listed on the National Register of Historic Places (NRHP) since 1978.

CF&I operated the Site from 1952 until 1974. Equipment in the Roebling facility was updated in the 1960s (e.g., CF&I replaced the open hearth furnaces with electric arc furnaces in 1968). During this period, the Roebling facility concentrated in the high carbon wire segment of the wire industry and withdrew from the suspension bridge construction market and from nonferrous wire production. Crane Co. became the major stockholder in CF&I, in the late 1960s and subsequently began a shutdown of CF&I's unprofitable production facilities. By the early 1970s, the Roebling facility's financial strength had declined, and Crane Co. decided to close the Roebling facility in 1974.

In June 1974, the plant ceased operations under CF&I. The Alpert Brothers Leasing Company (ABLC) purchased the machinery and equipment at the Site from CF&I in September 1974. ABLC formed the Roebling Steel and Wire Corporation (RSWC), which purchased the Site and certain other equipment from CF&I in October 1974. ABLC leased the machinery and equipment it bought to RSWC. RSWC filed for Chapter 11 bankruptcy in May 1975. ABLC/RSWC operated the facility until May 1979, when a new company (with new owners), the John A. Roebling Steel Corporation (JARSCO), was formed. Through private funds and financial assistance (in the form of guaranteeing the initial loan) from the Economic Development Administration (EDA) of the U.S. Department of Commerce and the New Jersey Economic Development Authority, JARSCO purchased and operated the Roebling facility. JARSCO ceased operations in November 1981 and leased portions of the Site to other businesses. JARSCO began liquidating in September 1982 and granted peaceful possession of the property to EDA in April 1983.

The Roebling Wire Company (RWC) purchased the wire mill equipment from JARSCO and leased the wire mill premises. RWC began wire production in January 1982, closed in the summer of 1983, filed a Chapter 11 petition for bankruptcy, but continued to occupy the site premises until October 1985.

From 1978 through 1988, the Site supported a variety of other industrial activities in addition to the RWC, and included a polymer-reclamation facility, a storage facility for vinyl products, a warehouse facility, a facility for repairing and refurbishing refrigerated trailers and shipping containers, a storage facility for insulation, and an equipment storage facility for a construction company.

The EDA provided financial assistance to JARSCO starting in 1979 to promote companies and businesses on the Site; all of these companies have since ceased operating on the Site. EDA remained the creditor in possession of the real property and equipment at the Site until the property was turned over to Florence Township as a result of the February 2001 condemnation proceeding.

Manufacturing and Waste Disposal Activities

Steel production resulted in the generation of significant quantities of waste materials in both liquid and solid forms.

Liquid Wastes

The majority of liquid wastes were discharged to Crafts Creek and the Delaware River. The facility contained an underground piping system of storm, sanitary, acid and oil lines, and seven discharge outfalls to the Delaware River and Crafts Creek. The discharge outfalls carried storm water, cooling water, spent acid, acid rinse waters, oily wastewaters, and effluent from the wastewater treatment plant (post-1973) to the Delaware River and Crafts Creek.

Wire was cleaned using hydrochloric or sulfuric acids to remove scale. The principal acid contamination was caused by dumping tubs of spent acid used in the cleaning departments into the sewer system without neutralization.

Large volumes of surface water and groundwater were used for plant operations. As a result of the different mill processes used at various times in each building, process water would be contaminated with iron, lead, zinc, oil, chloride, phosphate, sulfate, soap, and spent pickle acid.

Solid Wastes

Slag material was generated as a means to separate the metal impurities from the moltened steel and was disposed of in the slag area along the Delaware River. The slag area was used primarily for the disposal of slag. Materials disposed in the landfill included: spent refractory brick, baghouse dust, well scale, furnace scale, and decommissioned process equipment were disposed of in the landfill on-site.

Records were kept of the annual quantities of lead used at the Site. For example, in 1965 the following processes used lead in these amounts:

Galvanizing Shop (Building 8)	- 250,359 pounds
Patenting Shop (Building 10)	- 946,675 pounds
Wire Mill #2 (Building 13)	- 525,920 pounds

Waste lead was removed as dross, accumulated in drones and sold to off-site smelters. In addition, lead was released into the atmosphere as volatilized gases and found in residues on process equipment.

Air Pollutants

No dust control system was used during the operation of the open hearth furnaces at the Site. Dust would be released within the buildings, and, of course, directly out of the stacks. When the electric arc furnaces replaced the open hearth furnaces in 1968, dust control facilities were used.

Compliance History

The lack of properly operated environmental control facilities at the Site resulted in several regulatory agencies issuing notices of noncompliance to site owners and operators. On May 19, 1964, the New Jersey Department of Health (NJDOH) recommended that CF&I install a wastewater treatment plant. A NJDOH status report described operations conducted at the Site by CF&I, which was then discharging 15-million gallons per day (mgd) of untreated acidic industrial wastes and plant cooling water into the Delaware River. The effluent was acidic and contained high levels of iron and other metals, suspended solids, and oil. On May 31, 1968, NJDOH ordered CF&I to cease polluting the Delaware River and required the construction of a wastewater treatment plant. In 1972, the wastewater treatment plant was completed and placed into operation.

On November 15, 1974, the New Jersey Department of Environmental Protection (NJDEP) met with the facility owners to discuss various aspects of the operations at the Site, including the absence of liners under the sludge lagoons, groundwater contamination, landfill operations, oil unloading, and transmission and storage operations.

In October 1979, NJDEP issued JARSCO a permit to upgrade and operate an industrial wastewater treatment plant (the CF&I wastewater treatment plant with improvements). The permit required the installation of monitoring wells and the performance of bioassay monitoring. The DRBC granted approval to JARSCO to withdraw surface water from the Delaware River and to discharge wastewater to the Delaware River in compliance with DRBC water quality standards.

On June 13, 1979, the JARSCO operation was inspected by NJDEP and the Burlington County Health Department. Six hundred 55-gallon drums containing waste oil were discovered on-site. NJDEP requested that these drums be removed. In November 1979, NJDEP issued a notification of violation to JARSCO, as a result of the inspection of the Site on June 13, 1979. JARSCO was later cited for committing a health and safety violation as it attempted to remove the drums from the Site without completing the required waste manifests.

On January 29, 1980, NJDEP named JARSCO as one of 38 hazardous waste sites most urgently needing cleanup in the State of New Jersey. The following potential pollution sources were identified: 100 oil drums, PCB transformers, a tire pile, abandoned oil and chemical storage tanks, and bag house dust storage piles.

In 1981, JARSCO was cited by NJDEP for noncompliance with conditions in the permit for operation of its wastewater treatment plant (conditions such as installation of monitoring wells, bioassay monitoring, flow measurement, and discharge monitoring). On May 11, 1981, NJDEP issued a Notice of Prosecution to JARSCO seeking the removal of oil drums and other hazardous wastes stored on site. The U.S. Environmental Protection Agency (EPA) performed a Resource Conservation and Recovery Act (RCRA) inspection of the facility, and JARSCO was cited for storage of baghouse dust without a permit. NJDEP inspected and sampled the sludge lagoons and found the sludge to contain volatile organics and heavy metals.

On July 22, 1981, JARSCO removed 20,000 gallons of waste oil and 60 cubic yards of contaminated soil from the Site.

On February 1, 1982, NJDEP issued JARSCO a deadline for the submittal of a compliance plan, which would address a violation of monitoring requirements for the wastewater treatment plant. Since the JARSCO plant had closed in November 1981, it was not required to meet the deadline.

In June 1982, NJDEP required the installation of two groundwater monitoring wells downgradient from the lagoons and one well upgradient from the lagoons. On June 28, 1982, EPA issued a Complaint and Compliance Order that directed JARSCO to stop storing hazardous wastes without a permit, to remove spilled dust and contaminated soil, and to address contaminant migration.

In December 1982, an acid cloud at the RWC operations on-site was reported. No violations could be detected when the facility was inspected by NJDEP.

In February 1983, JARSCO officially abandoned the Site without sufficiently addressing the permit compliance violations first cited in 1981.

Later in 1983, NJDEP inspected the Site and found that permits and certificates were missing from some of the RWC equipment. A Compliance Evaluation Inspection performed by NJDEP found unacceptable conditions at the RWC portion of the Site.

Removal and Remedial Actions to Date

The Site was proposed for inclusion on EPA's National Priorities List of Superfund sites in December 1982, and added to the list in September 1983. In May 1985, EPA began a remedial investigation and feasibility study (RI/FS) to characterize the nature and extent of the contamination present at the Site. Due to the numerous contamination sources and various pathways for exposure associated with the Roebling Steel Site, EPA is addressing the remediation in a phased approach.

As indicated in the table below, four removal actions have been conducted at the Site. In December 1985, the State of New Jersey removed picric acid and other explosive chemicals from one of the on-site laboratories. EPA performed a removal action between October 1987 and November 1988, that included the removal of lab pack containers and drums containing corrosive and toxic materials, acid tanks, and compressed gas cylinders. EPA conducted another removal action in October 1990 that included fencing a portion of the Slag Area and excavating contaminated soil in an area of the Roebling Park, which borders the facility. In October 1998, EPA initiated a removal action addressing both the interior and exterior friable asbestos-wrapped piping, and completed this action in November 1999.

The first ROD for the Site was signed in March 1990, and resulted in the completion of a remedial action in September 1991. That remedial action, the first of several anticipated remedial actions, known as operable units (OUs), continued the removal or remediation of contaminated source areas. It included the removal and off-site treatment and disposal of remaining drums, transformers containing oil contaminated with polychlorinated biphenyls (PCBs), the contents of exterior abandoned tanks, a baghouse dust pile, chemical piles, and tire piles.

A second ROD was signed in September 1991, to address the southeast playground (OU2), and a 34-acre Slag Area (OU3). The remedy selected for the southeast playground included excavating contaminated soil hot-spots, off-site treatment, and disposal at an appropriate facility. The Corps of Engineers (COE) was given the responsibility to design and implement the remedy components selected in the ROD. To expedite the cleanup of the playground, the EPA Region II Removal Action Branch conducted the cleanup of the playground in the Fall 1994, after the COE submitted a final design to EPA. The remedy selected for the Slag Area included treating hotspots, and then covering the entire 34-acre Slag Area with a soil cap and vegetation. EPA is proposing changes to the

RESPONSE ACTIONS	DESCRIPTION AND STATUS
Removal Actions • Removal Action 1	Removal of drums, lab pack containers, acid tanks, and compressed gas cylinders. Action completed in 1988.
• Removal Action 2	Removal of contaminated surface soils from the Roebling Park, and installation of a perimeter fence around the Slag Area. Action completed in 1991.
• Removal Action 3	Removal of site-wide friable asbestos on interior and exterior piping, removal of heavy metal process dust, and liquids and solids from vats and tanks.
ROD 1 (1990) • OU1	Removal of drums, transformers, tanks, a baghouse dust pile, chemical piles, tires. Action completed in 1991.
ROD 2 (1991) • OU2	Removal of contaminated surface soils from the Southeast Park. Action completed in 1995.
• OU3 (the subject of this ROD)	This amendment (also the subject of this ROD) will modify the original remedy selected for the Slag Area. Design near completion.
ROD 3 (1996) • OU4	Remediation of 70 abandoned buildings which contain contaminated process dust, contaminated equipment, tanks, pits and sumps, underground piping. Action was started in the summer of 1999.
ROD 4 (2003) • OU5 (the subject of this ROD)	This ROD will address all remaining contamination problems at the Site, such as the site-wide soils, river and creek sediments, and groundwater, and will recommend changes to the Selected Remedy for the Slag Area identified in the ROD 2. This is the last OU at the Site.

Selected Remedy for the Slag Area as part of this ROD. The remedial design for the Slag Area cap and shoreline revetment is near completion.

In September 1996, a third ROD was signed by EPA selecting a remedy which includes removal and disposal of the contents from underground storage tanks and underground piping, friable asbestos abatement, decontamination and demolition of buildings, recycling or disposal of scrap metal from building debris and contaminated equipment, off-site disposal of process dust and the contents of above-ground tanks, pits, and sumps, and the restoration of the Main Gate House, (listed on the National Register of Historic Places in 1978 as a property within the Village of Roebling Historic District) and other historic mitigative measures (OU4). The areas of concern (AOCs) that have already been remediated are the following: aboveground and underground storage tanks, friable asbestos, process dust, the contents of pits and sumps, underground oil and chemical lines, soils contaminated with oil, and the landfill. Certain areas of the Site have been investigated (trenching of soils) to search for AOCs. EPA continues to work on the cleanup of the buildings and contamination sources.

The overall strategy for the Roebling Steel Site addresses contamination in a manner that would allow most of the Site to be returned to productive use for industrial, commercial, or recreational purposes. Additional investigations, remediation measures, and institutional controls would be needed for residential use of the property. EPA has completed OU1 and OU2 called for by the first two RODs and the on-going remedial action called for by the third ROD was started in the summer of 1999. EPA will address the remaining cleanup work at the Site in this fourth and final ROD. Concurrent with ongoing design activities, an additional RI/FS was recently completed, which addresses surface and subsurface soils, Delaware River and Crafts Creek surface water and sediments, and groundwater. The RI/FS report forms the basis for the fourth ROD and the proposed changes to the remedy for the Slag Area selected in the 1991 ROD at the Roebling Steel Site. The RI/FS incorporates an extensive data investigation and discussion of potential cleanup alternatives for remaining areas of contamination at the Site.

Enforcement Activities

In 1985 and 1987, General Notice Letters, pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, (CERCLA) were sent to potentially responsible parties (PRPs), including past and present owners, operators, and tenants, informing them of their potential liability and affording them the opportunity to participate in the respective response actions. The PRPs declined to participate in these actions.

In December 1987, a PRP search was completed and Section 104(e) information requests were sent to PRPs identified as potentially viable.

EPA prepared a litigation referral which recommended the filing of a proof of claim in a Chapter 11 bankruptcy proceeding by CF&I, a former owner and operator of the Site. During CF&I's ownership and operation of the plant and real property, the company's handling, storage and disposal practices resulted in the release or threatened release of hazardous substances at the Site. On March 14, 1991, the United States Department of Justice (DOJ) filed a proof of claim and EPA attained the status of an unsecured creditor of CF&I.

In June 1991, a supplemental PRP search was initiated to fill data gaps in the initial PRP search and incorporate new information.

In July 1991, General Notice Letters pursuant to CERCLA were sent to PRPs, reiterating notification of potential liability, affording them the opportunity to participate in the response actions for the Site, and informing them of the public comment period and public meeting regarding the selection of a remedy for the slag area and southeast playground.

In January 1992, DOJ submitted a Statement of Debtor's Liability which provided an estimation of the debtor's liability and preserved EPA's status as an unsecured creditor in the CF&I bankruptcy proceeding. Since EPA and CF&I were unable to agree on a mutually acceptable dollar amount representing CF&I's liability for EPA's environmental claims at the Site, the Court ordered an estimation proceeding to value EPA's claim. The Court scheduled various pre-trial activities from February through June 1992.

In June and July 1992, DOJ and EPA took part in an estimation proceeding as part of the CF&I Chapter 11 bankruptcy proceeding. Closing arguments were held in August 1992. Shortly thereafter EPA and CF&I entered into a settlement and stipulated as to the value of EPA's allowed claim.

In September 1993, the supplemental PRP search was completed.

In June 1995, a settlement agreement between EPA and Reorganized CF&I providing for a lump sum payment of $2.2 million was signed. Reorganized CF&I paid EPA the $2.2 million in August 1995.

In 1996-2000, EPA continued assessing the potential liability of the various tenants through employee interviews, review of documents, and Section 104(e) information requests.

HIGHLIGHTS OF COMMUNITY PARTICIPATION

The Proposed Plan and supporting documentation for OU5 and OU3 were released to the public for comment on August 21, 2003. These documents were made available to the public at the EPA Administrative Record File Room, 290 Broadway, 18th Floor, New York, New York; the Florence Township Public Library, Roebling, New Jersey; and the Florence Township Municipal Building, Florence, New Jersey.

In August of 2003, EPA issued a notice in the Burlington County Times newspaper and the Bordentown Register News newspaper, which contained information relevant to the public comment period for the site, including the duration of the comment period, the date of the public meeting and availability of the administrative record. A Superfund Flyer was mailed to individuals on a mailing list maintained by EPA for the Site. The public comment period began on August 21, 2003 and ended on September 19, 2003.

A public meeting was held on August 28, 2003, at the Florence Township Municipal Building located on Broad Street, Florence, New Jersey. The purpose of this meeting was to inform local officials and interested citizens about the Superfund process, to discuss the Proposed Plan and receive comments on the Proposed Plan, and to respond to questions from area residents and other interested parties. Responses to the comments received at the public meeting and in writing during the public comment period are included in the Responsiveness Summary.

SCOPE AND ROLE OF THIS OPERABLE UNIT

For the purpose of planning response actions, EPA has addressed the Site in separate operable units. EPA has completed three removal actions, OU1 and OU2 called for by the first two RODs, and the on-going remedial action called for by the third ROD was started in the summer of 1999.

This action, referred to as OU5, will be the final response action for the Site. The scope of this proposed action specifically addresses contaminated site-wide soils, sediments, and groundwater. Additionally, the Selected Remedy for the Slag Area identified in the September 1991 ROD, referred to as OU3, will be changed to the OU5 Selected Remedy for the soils.

EPA plans to coordinate the Selected Remedy for OU5 and amended remedy for OU3 with the remedy selected for OU4. The principal threats posed by the Site consist mainly of wastes products and materials from the steel manufacturing process that have contaminated the soils, sediments and groundwater. These sources of contamination, also referred to as areas of concern (AOCs), will be remediated as part of the OU4 building cleanup. Therefore, any AOC that may be identified during implementation of OU4 will be properly delineated and remediated prior to capping activities.

SUMMARY OF SITE CHARACTERISTICS

EPA, through its contractor, the Foster Wheeler Environmental Corporation (FW), previously known as Ebasco Services, conducted field investigations in multiple phases between November 1985 to April 1998. The purpose of these investigations was to determine the nature and extent of contamination of the entire Site. The field work necessary to fully characterize those areas to be included in the fourth ROD was completed in April 1998. Further, a groundwater modeling effort was conducted based on the data gathered during the field investigations which culminated with the development of a technical memorandum in March 2002 on the results of the groundwater modeling and specified in Appendix D of the RI Report. The potential areas of contamination at the Site were addressed in the following investigations and the results can be found in the RI report, which was completed in May 2002:

Geophysical Survey and Test Pit Investigation: potential areas for buried wastes on the Site were identified during the geophysical survey and investigated through test pit excavations.

Surface and Subsurface Soil Investigation: off-site soils, on-site soils, test pit soils, and potential hot spot soils (sludge lagoons, former transformer pads, asbestos soil, oiled roadways, stressed vegetation).

Sediment Investigations: potential impacts to the Delaware River and Crafts Creek from site-originated surface water run-off, sewer outfall, and groundwater discharges; establishing contaminant concentration ranges throughout the Delaware River; macroinvertebrate toxicity and benthic community evaluation; and delineation of sediment hot spots.

Hydrogeologic Investigation: monitoring well installations, hydropunch program, groundwater elevation measurements, on-site groundwater sampling, residential well sampling, groundwater seep sampling, aquifer testing, and abandonment of facility wells.

Surface Water Investigation: potential impacts to the Delaware River and Crafts Creek from site-originated surface water run-off, sewer outfall, and groundwater discharges from the Slag Area and the back channel area; and establishing contaminant concentration ranges throughout the Delaware River.

Ecological Investigation: ecological inventory, wetlands investigation, and biota investigation.

Air Particulate Investigation: potential impacts of particulates migration to nearby residents and sensitive environments.

Site Surveying and Mapping: establishing a base map for the Site and adjacent areas of Crafts Creek that would depict physical features, sampling locations, topographic data, and site boundaries.

The results of those investigations are summarized in the following sections.

Soils

Exceedances of federal and State criteria noted throughout the ROD for soil concentrations are based on the most stringent soil criteria represented between EPA Soil Screening Levels (SSL) (Migration to Groundwater, Ingestion and Inhalation) and NJDEP Soil Cleanup Criteria (Impact to Groundwater, Non-Residential Direct Contact and Residential Direct Contact), and are shown in Table 1. Table 2 through Table 7 summarize detected contaminant concentrations for both surface and subsurface soils.

<u>Main Plant Surface Soils</u> - Surface soil samples were collected from depths up to and including two feet below ground surface. Inorganic contaminants were detected in all collected site-wide surface soil samples. Concentrations of twelve inorganics exceeded federal and State criteria in one or more of the surface soil samples. The inorganics most frequently exceeding criteria were lead, chromium, and cadmium. Detected maximum and average concentrations are listed below.

Contaminant of Concern	Frequency of Exceedence	Maximum Concentration	Average Concentration
Lead	114/115 samples	69,000 mg/kg	5,954 mg/kg
Chromium	120/120 samples	1950 mg/kg	146 mg/kg
Cadmium	68/112 samples	390 mg/kg	26 mg/kg

Concentrations of thirty-seven semi-volatile organic compounds (SVOCs) were detected in one or more of the collected samples. Polycyclic aromatic hydrocarbons (PAHs) were the most frequently detected SVOCs and include: 2-methylnaphthalene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(g,h,i)pyrene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, naphthalene,phenanthrene and pyrene. Of these PAHs, average detected concentrations ranged from 706 µg/kg for indeno(1,2,3-cd)pyrene (detected in 39 of 61 samples), to 9,270 µg/kg for 2-methylnaphthalene, which was detected in 35 of 61 samples. The PAHs most frequently exceeding criteria were benzo(a)pyrene, benzo(a)anthracene, and benzo(b)fluoranthene. Concentrations of pesticides exceeded criteria in less than five percent of the samples and polychlorinated biphenyls (PCBs) exceeded criteria in approximately eleven percent of the samples. Concentrations of volatile organic compounds (VOCs) were detected sporadically throughout the Site, but none were detected above the criteria.

<u>Main Plant Subsurface Soils</u> - Subsurface soil samples were collected at specific depth intervals up to 45 feet below ground surface. Concentrations of 11 metals exceeded federal and State criteria in one or more of the samples. The frequency of exceedances in subsurface soil samples was significantly lower than that for the surface soil samples. While criteria exceedances were less frequent in subsurface soil samples than surface soil samples, their distribution across the Site was equally widespread.

The inorganics most frequently exceeding criteria were antimony, arsenic, and chromium. Cadmium and lead, which were among the metals most frequently exceeding criteria in surface soil samples, were detected in less subsurface soil samples at concentrations exceeding criteria. Detected maximum and average concentrations are listed below.

Contaminant of Concern	Frequency of Exceedence	Maximum Concentration	Average Concentration
Antimony	32/101 samples	36 mg/kg	10 mg/kg
Arsenic	94/118 samples	80 mg/kg	16 mg/kg
Chromium	98/115 samples	536 mg/kg	44 mg/kg
Lead	98/112 samples	90,600 mg/kg	1,838 mg/kg
Cadmium	15/114 samples	20 mg/kg	5 mg/kg

Concentrations of twenty-nine SVOCs were detected in one or more of the subsurface soil samples. Frequency of detection and average detected concentrations were significantly lower than those in surface soil samples. The most frequently detected SVOCs were benzo(a)anthracene (33 of 124 samples), benzo(b)fluoranthene (35 of 121 samples), benzo(a)pyrene (37 of 124 samples), chrysene (40 of 124 samples), fluoranthene (40 of 124 samples), phenanthrene (41 of 125 samples) and pyrene (45 of 125 samples). Of these most frequently detected SVOCs, concentrations of benzo(a)pyrene, benzo(a)anthracene, and benzo(b)fluoranthene exceeded criteria in one or more of the samples. There were sporadic detections of pesticides, PCBs and VOCs that were above the criteria.

Sediments

Sediments from the main channel and the back channel of the Delaware River, Crafts Creek, and Crafts Creek wetlands were sampled in 1989, 1996 and 1998. Samples were taken upriver, adjacent, and downriver of the Site, and analyzed for volatile organic compounds, semi-volatile organic compounds, pesticides, and metals. Sediment samples were taken due to the Site's historic discharges of contaminants from its seven discharge outfalls which carried storm water, cooling water, spent acid, acid rinse waters, oily wastewaters, and effluent from the wastewater treatment plant (post-1973) to the Delaware River and Crafts Creek. Exceedances of criteria for sediments noted throughout the ROD are shown on Figure 4 and based on the most stringent sediment criteria represented between Canadian Low Effects Level (LEL) and Canadian Severe Effects Level (SEL). In the absence of LEL and SEL values, Effects Range - Low (ER-L) and Effects Range - Medium (ER-M) values were used, and are shown in Table 8. Tables 9.1-9.3 through Tables 11.1-11.2 summarize detected contaminant concentrations for both Delaware River and Crafts Creek sediments.

<u>Main Channel of the Delaware River</u> - The concentration ranges of individual PAHs and metals in the shipping channel, upriver, adjacent and downriver sediment samples were similar to each other. PCBs were not detected in any sediment samples taken from the main channel of the Delaware River.

<u>Back Channel of the Delaware River</u> - The most significant metal contamination was detected in sediment samples SD25, SD27 and SD51. These samples were collected in the back channel immediately downriver of Outfalls #4 and #3. These samples exhibited the highest detected concentrations of virtually all of the inorganic contaminants, including antimony, arsenic, beryllium, chromium, cobalt, copper, iron, lead, manganese, nickel, silver, vanadium and zinc. In addition, concentrations for many of the metals detected in sediment samples SD25, SD26 and SD27 significantly increased with depth. Average concentrations for the samples taken on the surface and at depth at all three sampling locations are aluminum (10,030 mg/kg, 19,963 mg/kg), chromium (117 mg/kg, 236 mg/kg), copper (241 mg/kg, 730 mg/kg), iron (163,000 mg/kg, 346,000 mg/kg), lead (213 mg/kg, 883 mg/kg), manganese (1,410 mg/kg, 2,887 mg/kg), nickel (93 mg/kg, 193 mg/kg), potassium (1,318 mg/kg, 3,297 mg/kg), and vanadium (31.5 mg/kg, 69 mg/kg). The contaminant concentrations increase with depth, which would be consistent with historic discharge from the outfalls.

Elevated total PAH concentrations of 10,657 µg/kg and 7,358 µg/kg were found in samples taken immediately downriver of Outfalls #5 and #6, respectively. The highest individual PAH concentrations in these samples were fluoranthene (1,600 µg/kg and 1,100 µg/kg) and pyrene (1,500 µg/kg and 960 µg/kg). Total pesticide concentrations ranged from 50 µg/kg to 78 µg/kg. Relatively low levels of PCBs were detected in sediment samples taken from the back channel.

<u>Crafts Creek</u> - All of the Crafts Creek sediment samples exceeded reference ranges for at least one metal. One or more of the sediment screening criteria were exceeded by Crafts Creek samples for arsenic, cadmium, chromium, copper, lead, manganese, mercury, nickel and zinc.

Sediment samples from Crafts Creek contained higher concentrations of PAHs than found in the Delaware River sediment samples. The total PAH values ranged from 2,830 µg/kg to 13,400 µg/kg. The highest individual PAH concentrations were benzo(a)anthracene (1,100 µg/kg), benzo(b)fluoranthene (1,600 µg/kg), benzo(k)fluoranthene (1,400 µg/kg), fluoranthene (2,300 µg/kg), phenanthrene (1,400 µg/kg), and pyrene (2,000 µg/kg). No patterns of PAH sediment contamination are apparent for this portion of Crafts Creek. Low levels of PCBs were detected in sediment samples taken from Crafts Creek.

Groundwater

The data analysis for the groundwater samples collected using conventional methods (prior 1996) relies primarily on the dissolved inorganic results, because the total inorganic results may be biased high due to interference from suspended particles in the samples. Additionally, the dissolved inorganic data were used in the analysis of the 1996-1997 HydroPunch screening results because of the nature of the sampling which increased the suspension of particles in the sample. Analysis of groundwater sample results collected using low-flow methodology (after 1996) relies on the total inorganic results. It is believed that the low-flow sampling data is more representative of the true groundwater quality and conditions at the Site. Exceedances of federal and State standards noted for groundwater concentrations throughout the ROD are shown on Figure 4 and based on the most stringent groundwater criteria represented between NJ Groundwater Quality Standard (GWQS) and federal Maximum Contaminant Levels (MCLs), and are shown in Table 8. Table 12 through Table 24 present a statistical summary of the groundwater data.

Analysis and correlation of sampling data collected from 1990 through 1998 indicate that there are sporadic exceedences of inorganics in a small number of wells. The areas of sporadic contamination are generally found in the Slag Area, landfill area, and near the wastewater treatment plant/Building 10. There are sporadic exceedences located in the southeastern portion of the Site. The metals exceeding the most stringent standards are antimony, arsenic, beryllium, cadmium, copper, lead, nickel, selenium, silver and zinc. Elevated levels of aluminum, iron, and manganese were also present; these metals are known to be widespread and naturally occurring, however, they were also part of the site manufacturing process. VOC and SVOC compounds were detected at low levels and a lower frequency than metals in the upper aquifer. There were no exceedences of VOC and SVOC compounds in the lower aquifer. The results of the inorganic compounds are discussed below.

<u>Upper Aquifer Inorganic Exceedences</u> - Most notable are the following results exceeding standards found in monitoring wells (MW) and hydropunch (HP) samples in the above-mentioned areas:

- Antimony was detected at concentrations of 37.1 µg/L in MW29 in the Slag Area, 38.5 µg/L in MW06 in the landfill area, 35.8 µg/L in MW16 located in the southeastern portion of the Site, and 37 µg/L in MW13 located in the southeastern portion of the Site. The standard for antimony is 6 µg/L.

- Arsenic was detected at concentrations of 8.7 µg/L in MW24S in the wastewater treatment plant area, 8.1 µg/L and 10.6 µg/L in MW37 in the Slag Area, and 14.6 µg/L in MW 38 in the Slag Area. The standard for arsenic is 8 µg/L.

- Copper was detected at concentrations of 4,050 µg/L and 5,650 µg/L in MW21 in the landfill area, and 1,960 µg/L in HP21 near Building 13. The standard for copper is 1,000 µg/L.

- Lead was detected at concentrations of 13.2 µg/L in MW14 located on the southern portion of the Site, 36.1 µg/L and 54.5 µg/L in MW37 in the Slag Area, 66.8 µg/L in MW42 in the Slag Area, 17.9 µg/L in HP20 located in Building 10, 29.6 µg/L in HP 21 near Building 13, and 10 µg/L in HP22 near Building 88. The standard for lead is 10 µg/L.

<u>Lower Aquifer Inorganic Exceedences</u> - Most notable are the following results exceeding standards in the above-mentioned areas:

- Arsenic was detected at a concentration of 95 µg/L in MW17D located on the southeastern portion of the Site.

- Beryllium was detected at concentrations of 16.2 µg/L and 22 µg/L in MW24D in the wastewater treatment plant area. The standard for beryllium is 4 µg/L.

- Lead was detected at a concentration of 37 µg/L in MW08D near Outfall No. 6.

- Zinc was detected at concentrations of 18,400 µg/L in MW20D in the landfill area, 14,400 µg/L in MW24D in the wastewater treatment area, and 20,700 µg/L in MW32D near Building 10. The standard for zinc is 5,000 µg/L.

<u>Groundwater Model Results</u>

A groundwater model was developed to simulate the current metals contamination in the groundwater and predict the metals concentrations in the future under natural attenuation and other various remediation scenarios. The modeling included (1) development of a calibrated steady-state groundwater flow model,

(2) development of a transient contaminant transport model, and (3) simulation of various groundwater remediation scenarios using the transport model. The details of the model and assumptions are provided in Appendix D of the Feasibility Study. The groundwater contamination used for the model included three exceedences of lead and one exceedence of arsenic in the upper aquifer, and three separate exceedences of lead, arsenic, and beryllium in the lower aquifer. The highest concentrations from data in the RI report were utilized in the modeling. The continuing source of metals contamination in the groundwater is the site-wide soils and slag found above and below the water table. The following scenarios were modeled.

Base Case Transport Model (No Source Removal and Natural Attenuation) - The base case transport model assumes that there is a continuing source of metals contamination and the source materials have not been removed. The modeling results indicate that with constant mass loading of arsenic, beryllium and lead for both 50 years and 100 years, the concentrations increase with time but the extent of contamination does not expand.

No Source Removal and Pump and Treat - This remediation scenario assumes that there is a continuing source of metals contamination (source materials have not been removed) and that a pump and treat system is installed to capture the lead, arsenic and beryllium contamination in the upper and lower aquifers. The modeling results indicate that after 50 years of pumping with no source removal, the concentration increase in a manner similar to the base case.

Source Removal and Natural Attenuation - This remediation scenario assumes that the sources of groundwater contamination are removed and the remaining metals are naturally remediated as a result of the flushing action of the groundwater flow system. The modeling results indicate that it will take thousands of years for the aquifer to reach the groundwater quality criteria which have been identified as cleanup targets for lead using this scenario.

Source Removal and Pump and Treat - This remediation scenario assumes that the sources of groundwater contamination are removed and that a pump and treat system is installed to capture the lead, arsenic and beryllium contamination in the upper and lower aquifers. The modeling results indicate there is minimal change in the lead concentrations after 50 years of pump and treat. Calculations were performed that indicate that it will take thousands of years for the lower aquifer to reach groundwater quality criteria which have been identified as cleanup targets under this scenario.

Hydraulic Containment and Cutoff Wall - This remediation scenario includes the installation of a linear cutoff wall in conjunction with an extraction well system. For the modeling effort, the cutoff wall was placed along the Delaware River with the extraction wells system inside the wall to capture groundwater that moves downgradient towards the wall. The modeling results indicate that hydraulic containment is achievable, however, groundwater quality criteria which have been identified as cleanup targets will not be reached under this scenario.

Surface Water

Surface water from the main channel and the back channel of the Delaware River and Crafts Creek were sampled in 1989, 1996 and 1998. Samples were taken upriver, adjacent, and downriver of the Site, and analyzed for volatile organic compounds, semi-volatile organic compounds, pesticides, and metals. Surface water samples were taken due to the Site's historic discharges of contaminants from its seven discharge outfalls to the Delaware River and Crafts Creek. The 1998 sampling effort included a series of ground water, ground water seep and surface water samples that were collected simultaneously during different stages of the tidal cycle. A total of 108 surface water samples were collected from the Delaware River along four transects oriented perpendicular to the northern shoreline of the Site, as well as from two transects located upstream from the Site. Ground water samples were collected from selected wells (MW33, MW31, MW30 and MW8S) along the northern periphery of the Site and from four ground water seep locations along the bank of the Delaware River to better integrate near-river ground water concentrations with the surface water effects. Exceedances of federal and State criteria for surface water noted throughout the ROD are shown on Figure 4 and based on the most stringent surface water criteria represented between New Jersey Surface Water Quality Standards, National Ambient Water Quality standards and Delaware River Basin Compact (DRBC) standards, and are shown in Table 8. Table 25 through Table 27 summarize detected contaminant concentrations for both Delaware River and Crafts Creek surface water.

<u>Main Channel of the Delaware River</u> - Most main channel surface water samples exhibited concentrations of aluminum (maximum concentration 358 µg/L at SW-10), copper (maximum concentration 11 µg/L at SW-04A), iron (maximum concentration 637 µg/L at SW-

10), lead maximum concentration 3.6 µg/L at SW-04) and manganese (maximum concentration 99 µg/L at SW-13) in excess of the most stringent surface water criteria. The concentrations of these metals in surface water samples located adjacent to the Site were generally lower than the 1998 background levels at 5 to 15 feet out into the channel at low tide. Dissolved zinc was an exception, which exceeded the background level at all of the three transect sampling locations in the main channel adjacent to the Site. The surface water impacts appear to be related primarily to colloidal and/or suspended sediments/particulate matter in the samples (SP01 through SP03 and transects TR01 through TR03). Interpretation of the data indicates that the surface water contamination appears to decrease in concentration outward from the Site, in a thin band parallel to the riverbank. This decrease in metals concentrations outward from the Site may be related to an increase in proportional mixing and dilution of site-related discharge waters with surface water outward into the channel. The 1998 surface water data appears to indicate limited impact to surface water in the main channel from site discharges.

Back Channel of the Delaware River - Numerous detections of aluminum, copper, and manganese were similar to those in the samples collected in the main channel. There were occasional detections of iron (maximum concentration 4,470 µg/L at SW-27), lead (maximum concentration 11.4 µg/L at SW-33) and silver (maximum concentration 4.7 µg/L at SW-32) in the back channel samples that were found to exceed the most stringent surface water criteria. Elevated iron, lead and silver concentrations detected near Outfalls #1 and #2 and near the mouth of Crafts Creeks may be related to the discharges of process waters. Again, the surface water impacts appear to be related primarily to colloidal and/or suspended sediments/particulate matter in the samples. The data also suggests that dissolved copper and zinc are present in groundwater discharges near the mouth of the back channel. Similar to the total concentrations, the highest concentrations of dissolved metal appear to be limited to the shallow back channel area adjacent to the riverbank. This dissolved metals contamination would contribute directly to the water quality in the main channel.

Crafts Creek - Elevated total iron and lead concentrations detected near Outfalls #1 and #2 and near the mouth of Crafts Creeks may be related to the discharges of process waters. Detected concentrations of iron ranged from 444 µg/L to 16,700 µg/L, with an average detected concentration of 6,087 µg/L and lead ranged from 1.2 µg/L to 21 µg/L, with an average detected concentration of 6.2 µg/L. The surface water contamination was detected primarily in the total fraction of the sample, indicating that contamination is most likely the result of impacts from suspended sediment/particles in the sample. A potential source of the metals contamination in Crafts Creek is particulate matter from historic process water discharges at the RSC site, which could have been deposited and resuspended by tidal currents moving in and out of the basin. However, other potential sources are present in the upstream portion of the Crafts Creek tidal basin, which could have contributed to the metals contamination.

Groundwater/Surface Water Interaction

A comparison of the concentrations of metals in the three groundwater seep sampling rounds, and a comparison of the concentrations and individual metals detected in the paired monitoring wells and groundwater seep samples indicates that during low tide the groundwater discharges to the surface water. The generally decreasing concentration gradients of total metals in surface water samples outward from the Site and the proximity of the contamination to known source areas of these metals, indicates that the Site is a contributor of this contamination. With the exception of dissolved copper and zinc, the total metal exceedances appear to be associated with colloidal and/or particulate matter in the river channel at the time of sampling. A potential source of the sediment contamination are dissolved metals in the groundwater discharges which have adsorbed onto solid matter, or contaminated particles and debris in surface water runoff, debris in surface water runoff, and historic discharge-contaminated process waters from storm drain lines/outfall areas at the Site.

OU3 Slag Area Soils (Summary of Pre- and Post- 1991 ROD Investigations)

1991 Focused Feasibility Study

EPA conducted a field investigation consisting of two stages in 1988 and 1989 to determine the type and extent of contamination in the Slag Area. The analytical results are presented in their entirety in the Focused Feasibility Study (FFS) completed in June 1991 and are summarized below.

Sampling results indicate that inorganics are the primary contaminants of potential concern in the Slag Area soils. These include the following metals: antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, magnesium, manganese, mercury, nickel, selenium, silver, vanadium, and zinc. In addition, volatile and semi-volatile organic contaminants were detected in the slag material at low levels. Wide variations in the metals composition among sampling locations indicate that the slag is not chemically homogeneous. Elevated concentrations of all the above-mentioned metals occurred within the 0-2 ft and 2-4 ft depth intervals, and elevated concentrations of barium, chromium, copper, iron, lead, magnesium, manganese, nickel, silver, vanadium, and zinc occurred within the 4-6 ft, 6-10 ft and 10-14 ft depth intervals. Lead contamination is of particular concern at the Slag Area because it was detected at high concentrations in many samples. The concentration ranges for lead detected in surface and subsurface samples were 47.6 - 10,400 mg/kg and non-detected (ND) - 8,650 mg/kg, respectively.

EP Toxicity testing was performed on the slag samples to determine the leaching behavior of the slag and whether the slag material should be classified as a characteristic waste subject to the Resource Conservation and Recovery Act (RCRA) requirements. The EP Toxicity results showed elevated concentrations of lead in two adjacent samples. In February 1991, Toxicity Characteristic Leaching Procedure (TCLP) testing was performed on the slag material (TCLP testing is the analytical method currently used, which replaced EP Toxicity testing). The TCLP results detected concentrations below the TCLP regulatory levels. Variability in the test results was believed to be due to the chemical heterogeneous nature of the slag material. Based on the FFS data, the volume of slag material that was thought to leach contaminants into the groundwater, thus needing treatment, was estimated to be approximately 30,000 cubic yards (cy) at that time. This estimated volume of slag material was based on a limited number of samples analyzed for EP Toxicity and TCLP tests. It was therefore anticipated that additional surface and subsurface sampling to further delineate hot spot areas would be necessary during the remedial design.

1999 Predesign Investigation

In 1991, the U.S. Army Corps of Engineers (COE) was given the responsibility to design and implement the remedy selected for the Slag Area. A pre-design investigation to delineate hot spot areas and to further characterize the Slag Area was conducted in two stages. Stages 1 and 2 were performed in the fall of 1993 and 1994, respectively, and the results are presented in the Predesign Investigation Report (PIR) issued by the design contractor, URS Consultants, Inc., in May 1999.

The results of TCLP testing for metals during the Stage 1 investigation confirmed the presence of the hot spot previously identified in the 1991 FFS, and identified three new hot spot areas. Exceedances of TCLP limits were detected for lead and cadmium only. Lead concentrations exceeding the TCLP limit of 5 mg/L ranged from 5.9 mg/L to 1,080 mg/L. Cadmium concentrations exceeding the TCLP limit of 1 mg/L ranged from 14.1 mg/L to 23.5 mg/L. The results of TCLP testing during Stage 2 further refined the hot spot limits delineated in Stage 1. Approximately a third of the TCLP exceedances reported in the four hot spot areas were below the water table.

Based upon the new data generated during the pre-design investigation, the volume of slag material estimated in the 34-acre Slag Area is approximately 710,000 cy, with 210,000 cy now exceeding the TCLP limits The spatial area associated with the hot spot zones is approximately eight acres. Therefore, based on the pre-design investigation data, the volume of slag material that would require treatment under the original ROD is now estimated to be approximately 210,000 cy.

Significantly, the analytical results from the hot spot delineation, groundwater, surface water and sediment investigations indicate that the metal contamination present in the slag material and groundwater does not show a significant impact on the biota in the sediments and the quality of the surface water. Samples indicating groundwater contamination are primarily a result of sampling less-mobile naturally occurring particulates with adsorbed metals contamination or other contaminated particulate matter, and to a much lesser degree, more mobile, dissolved metals contamination resulting from leaching. For these reasons, it was decided that for the Site, the TCLP test used as a basis for the 1991 ROD, was not a good indicator of hot spots in the Slag Area and instead, the aforementioned sediment, surface water, and groundwater sampling would be more relevant. The conclusions from these studies were incorporated into the RI/FS, and support the rationale for amending the OU3 ROD.

CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

Site Uses

In its current state, the Site is an inactive facility that was used from 1906 until 1982, primarily for the production of steel products. Prior to its inactivity, the Site contributed substantial tax revenues to Florence Township. The Site, zoned as "general manufacturing" is bordered by the residential areas of the Village of Roebling to the west and southwest, the Delaware River to the north, Crafts Creek to the east, and residential/industrial development to the south. Projected future land use of the Site includes mixed commercial and recreational uses. In 2001, Florence Township, the owner of the property, through the Burlington County Land Use Planning Office, completed a Reuse Conceptual Plan for redevelopment of the property.

Resource Uses

The groundwater underlying the Site is at the margin of the Potomac-Raritan-Magothy aquifer, designated by the State of New Jersey as a Class 2A drinking water aquifer. The Village of Roebling and Florence Township obtain their potable water from public supply wells located about two miles west of the Site. The city of Burlington, approximately six miles downstream from the Site, obtains potable water from both the Delaware River and shallow groundwater wells. The Delaware River, in the vicinity of the Site, is part of the freshwater portion of the estuary located in the DRBC Water Quality Zone 2, between the head of tide at Trenton, New Jersey and Northeast Philadelphia, Pennsylvania.

Ecological resources include areas of the Delaware River and Crafts Creek that support a diverse aquatic and wetlands community, including an important recreational fishery in the Delaware River. The river also represents a significant habitat for the endangered shortnose sturgeon *(Acipenser brevirostrum)*, which is known to occur in this section of the river. Additionally, a pair of federally threatened and state endangered bald eagles *(Haliaeetus leucocephalus)* have established a nest within 0.75 miles of the Site.

<u>SUMMARY OF SITE RISKS</u>

Based upon the results of the RI, a baseline risk assessment was conducted to estimate the risks associated with current and future site conditions. The baseline risk assessment estimates the human health and ecological risk which could result from the contamination at the Site in the absence of any actions to control or mitigate these under current- and future-land uses.

Human Health Risk Assessment

A four-step process is utilized for assessing site-related human health risks for a reasonable maximum exposure scenario: *Hazard Identification* - identifies the contaminants of concern at the Site based on several factors such as toxicity, frequency of occurrence, and concentration. *Exposure Assessment* - estimates the magnitude of actual and/or potential human exposures, the frequency and duration of these exposures, and the pathways, by which humans are potentially exposed. *Toxicity Assessment* - determines the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of adverse effects (response). *Risk Characterization* - summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site-related risks.

Hazard Identification - The baseline risk assessment identifies contaminants of potential concern, evaluates exposures pathways, and quantifies the degree of risk. The contaminants that are likely to pose the most significant risks to human health and the environment were identified, and are evaluated in detail. The complete list of contaminants of potential concern (COPCs) for each site medium are presented in Table 28.1 through 28.10.

Exposure Assessment - The baseline risk assessment evaluated the health effects which could result from exposure to contamination from surface and subsurface soils (incidental ingestion, dermal contact, and inhalation of suspended soil particulates), groundwater (ingestion, dermal contact, and inhalation), surface water (incidental ingestion, dermal contact and inhalation), sediments (incidental ingestion and dermal contact) and fish from Crafts Creek (ingestion). The risk assessment evaluated the exposure pathways believed to be associated with the greatest potential exposures. An identified pathway does not imply that exposures are actually occurring, but only that the potential exists for the pathway to be completed.

The potential exposure routes identified with current Site land use provides the potential for exposures to a child trespasser and to off-site residents via migration of windblown site soil particulates. Future land use is projected to include site redevelopment which could result in resident, commercial site worker, and construction worker receptors. Exposure assumptions were made for both average case and reasonable maximum case exposure scenarios. The potential exposure pathways considered for this risk assessment are presented in Table 29, and parameters and assumptions used in the calculations are in Table 30.1 through 30.28.

The risk assessment considered the Site's current land use as an abandoned industrial facility, and the projected future land uses as mixed commercial and residential use. These assumptions are solely for risk assessment purposes, and are not related to any reuse plan showing potential land use as recreational and commercial.

Toxicity Assessment - Under current EPA guidelines, the likelihood of carcinogenic (cancer-causing) and noncarcinogenic effects due to exposure to site chemicals are considered separately. Toxicity data for carcinogenic and noncarcinogenic effects are presented in Table 31 through Table 34.

Noncarcinogenic risks were assessed using a hazard index (HI), based on a comparison of expected contaminant intakes and safe levels of intake (Reference Doses). Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects. RfDs, which are expressed in units of milligrams per kilogram per day (mg/kg-day), are estimates of daily exposure levels for humans which are thought to be safe over a lifetime (including sensitive individuals). Estimated intakes of chemicals from environmental media are compared to the RfD to derive the Hazard Quotient for the contaminant in the particular medium. The HI is obtained by adding the Hazard Quotients for all compounds across all media that impact a particular receptor population. An HI greater than 1.0 indicates that the potential exists for noncarcinogenic adverse health effects to occur as a result of site-related exposures. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium. The HI is the ratio of the chronic daily ingestion of contaminant(s) divided by acceptable exposure level(s).

Potential carcinogenic risks were evaluated using the cancer slope factors (SFs) developed by EPA for the contaminants of concern. SFs, which are expressed in units of $(mg/kg\text{-}day)^{-1}$, are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to generate an upper-bound estimate of the excess lifetime cancer risk associated with exposure to the compound at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the SF. For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between 10^{-4} to 10^{-6}, representing a probability of one-in-ten thousand to one-in-one million that an individual could develop cancer as a result of chronic site-related exposure to a carcinogen over one's lifetime.

Risk Characterization - Based on the reasonable maximum exposure (RME) risk estimates, current off-site child residents, future on-site child/adult residents, and future construction workers may be exposed to COPCs in the surface soil, subsurface soil and groundwater. Based on the average case or cental tendency (CT) risk estimates, future on-site child residents may be exposed to COPCs in the surface soil, subsurface soil and groundwater. The risk calculations indicate that the ingestion and dermal contact pathways are the major contributors to the reasonable maximum exposure risk values. These values can be attributed to the contaminant concentrations of mainly antimony, arsenic and manganese. The carcinogenic risk values which marginally exceeded the target carcinogenic risk range (i.e., 10^{-4}-10^{-6}) and non-carcinogenic HI values that exceeded the benchmark HI criterion value of 1.0 are listed below. Cancer risk levels and hazard index values for each site medium are summarized in Table 35.1 through Table 35.9.

Additionally, under the reasonable maximum exposure scenarios, calculated total HI values are greater than the benchmark of one for both adults (total HI of 3.5) and children (total HI of 1.2) consuming fish from Crafts Creek, which can be attributed to copper for adults and mercury for both adults and children.

The results of the quantitative baseline risk assessment indicate that all exposures to receptors associated with the Delaware River and Crafts Creek sediments and surface water under current and future uses are acceptable, both in terms of cancer and non-cancer risks.

Quantitative Human Health Risks

A qualitative assessment was performed for lead in addition to the quantitative risk assessment described below. Lead was detected in soils, but was not be quantitatively addressed in the risk assessment, as there is no EPA established toxicity value for lead. Therefore, non-carcinogenic risk values calculated in the quantitative risk assessment discussed below were underestimated due to this exclusion. A health-based commercial screening level for lead in soil was calculated using the Adult Lead Exposure Model developed by EPA. The model is designed to assess exposure to adult workers; however the model is protective of the most vulnerable potential receptor under this scenario, the fetus of a pregnant worker. The upper bound risk-based remediation goal is 1753 mg/kg and the lower bound risk-based remediation goal is 749 mg/kg for lead for future site workers. In addition, an EPA directive has recommended a health-based residential screening level for lead in soil of 400 mg/kg. This screening level was calculated with the Integrated Exposure Uptake Biokinetic Model (IEUBK) for children, which takes into account the multimedia nature of lead exposures in a child's environment.

RISK ESTIMATES FOR SOIL

RME Risk Estimates

	Non-Carcinogenic Risk	
Current Off-Site Child Resident	1.6	manganese
Future On-Site Child Resident	15.3	antimony, arsenic, manganese
Future On-Site Adult Resident	1.2	antimony
Future Construction Worker	1.8	antimony

CT Risk Estimates

	Non-Carcinogenic Risk	
Future On-Site Child Resident	2.9	antimony

RISK ESTIMATES FOR GROUNDWATER

RME Risk Estimates

	Carcinogenic Risk	
Future On-Site Child Resident	1.3×10^{-4}	TCE, arsenic
Future On-Site Adult Resident	2.4×10^{-4}	TCE, arsenic

	Non-Carcinogenic Risk	
Future On-Site Child Resident	3.5	arsenic, manganese

CT Risk Estimates

	Non-Carcinogenic Risk	
Future On-Site Child Resident	1.4	arsenic

RISK ESTIMATES FOR FISH INGESTION

RME Risk Estimates

	Non-Carcinogenic Risk	
Current and Future Child Resident	1.2	mercury
Current and Future Adult Resident	3.5	copper mercury

The average and maximum lead concentrations detected in the surface soil samples (0-0.2 foot) are 7,161 mg/kg and 69,000 mg/kg. The average and maximum lead concentrations detected in the subsurface soil samples are 1,838 mg/kg and 90,600 mg/kg. These concentrations are significantly higher than EPA's health-based levels. Although a quantitative estimation of carcinogenic and non-carcinogenic risks attributable to lead could not be made, it is evident from the extremely high concentrations detected, that the soils pose an unacceptable risk.

Uncertainties

The procedures and inputs used to assess risks in this evaluation, as in all such assessments, are subject to a wide variety of uncertainties. In general, the main sources of uncertainty include:

- environmental chemistry sampling and analysis
- environmental parameter measurement
- fate and transport modeling
- exposure parameter estimation
- toxicological data.

Uncertainty in environmental sampling arises in part from the potentially uneven distribution of chemicals in the media sampled. Consequently, there is significant uncertainty as to the actual levels present. Environmental chemistry-analysis error can stem from several sources including the errors inherent in the analytical methods and characteristics of the matrix being sampled.

Uncertainties in the exposure assessment are related to estimates of how often an individual would actually come in contact with the chemicals of concern, the period of time over which such exposure would occur, and in the models used to estimate the concentrations of the chemicals of concern at the point of exposure.

Uncertainties in toxicological data occur in extrapolating both from animals to humans and from high to low doses of exposure, as well as from the difficulties in assessing the toxicity of a mixture of chemicals. These uncertainties are addressed by making conservative assumptions concerning risk and exposure parameters throughout the assessment. As a result, the risk assessment provides upper-bound estimates of the risks to populations near the site, and is highly unlikely to underestimate actual risks related to the site.

More specific information concerning public health risks, including a quantitative evaluation of the degree of risk associated with various exposure pathways, is presented in the risk assessment report.

Actual or threatened releases of hazardous substances from this Site, if not addressed by the preferred alternative or one of the other active measures considered, may present a current or potential threat to public health, welfare, or the environment.

Ecological Risk Assessment

A four-step process is utilized for assessing site-related ecological risks for a reasonable maximum exposure scenario: *Problem Formulation* - a qualitative evaluation of contaminant release, migration, and fate; identification of contaminants of concern, receptors, exposure pathways, and known ecological effects of the contaminants; and selection of endpoints for further study. *Exposure Assessment* - a quantitative evaluation of contaminant release, migration, and fate; characterization of exposure pathways and receptors; and measurement or estimation of exposure point concentrations. *Ecological Effects Assessment* - literature reviews, field studies, and toxicity tests, linking contaminant concentrations to effects on ecological receptors. *Risk Characterization* - measurement or estimation of both current and future adverse effects.

The ecological risk assessment began with evaluating the contaminants associated with the Site in conjunction with the site-specific biological species/habitat information. The primary areas of concern are the Delaware River and Crafts Creek, which support a diverse aquatic and wetlands community, including an important recreational fishery in the Delaware River. The river also represents a significant habitat for the endangered shortnose sturgeon *(Acipenser brevirostrum)*, which is known to occur in this section of the river. Additionally, a pair of federally threatened and state endangered bald eagles *(Haliaeetus leucocephalus)* have established a nest within 0.75 mile of the Site. Terrestrial ecological receptors are limited due to the lack of appreciable terrestrial habitat and the industrial setting of the Site.

Results of the ecological risk assessment determined that PAHs, arsenic, chromium, copper, iron, lead, manganese, and nickel in the sediments of the back channel and Crafts Creek are impacting or pose risks to ecological receptors in these environments. The complete list of COPCs are presented in Table 28.11. Contaminant inputs to the river include the historical deposition of slag into the river, historical discharge from the outfalls, site surface runoff, wind-blown dust particulates into the river, groundwater discharge, and discharge from Crafts Creek. Input into the creek include historical discharge from the outfalls, site surface runoff, groundwater discharge, and tidal influxes. Delaware River and Crafts Creek biota contaminant exposure pathways include direct uptake (ingestion and absorption) by planktonic and benthic organisms from surface water, aquatic and wetland vegetation from sediments, and indirect uptake by consumers via food chain pathways, such as the blue heron, and are presented in Table 29.1.

The results of the ecological risk assessment indicate that the sediments in the following areas of the Delaware River and Crafts Creek pose a risk to the ecological receptors. Two areas of the back channel of the Delaware River adjacent to discharge outfalls and three areas in Crafts Creek showed significant reductions in survival of benthic organisms. The observed impacts in the benthic community included a communal shift to taxa known to tolerate sediments contaminated with metal wastes. These areas also exceeded the lead threshold levels for the blue heron. The primary exposure pathway was identified as the incidental ingestion of sediments. The target cleanup levels for the COCs in the sediments are presented in Table 35.10.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are specific goals to protect human health and the environment. These objectives are based on available information and standards such as applicable or relevant and appropriate requirements (ARARs) and appropriate criteria, advisories, and guidance (i.e., To Be Considered (TBCs) materials), and calculated risk-based levels established in the risk assessment. Compliance with ARARs/TBCs may be "waived" if site-specific circumstances justify such a "waiver". A complete listing of ARARs and TBCs is included in Table 36 of this ROD. Remedial action objectives developed for the soil (including the 34-acre Slag Area), sediments and groundwater, considers all identified site concerns and contaminant pathways, and are presented below. Table 37 presents the most stringent ARAR/TBC target cleanup levels for the contaminated media.

Soils (Including the Slag Area)

The RAOs for site-wide soils and the Slag Area include:

- Prevention of human exposure to contaminated site-wide soils and slag material based on current and anticipated future uses;

- Reduce risk to ecological receptors from exposure to contaminated soils and slag material to acceptable levels;

- Minimize contaminant migration from the soils and slag material to the groundwater and surface waters to levels that ensure the beneficial reuse of these resources;

- Comply with ARARs and TBCs consistent with current and anticipated future use, or request waivers.

The RAOs are based on the results of the baseline risk assessment and a comparison to criteria to be considered for screening and evaluation of soil quality. The federal and State criteria used for soil are based on the most stringent soil criteria represented between EPA Soil Screening Levels (SSL) (Migration to Groundwater, Ingestion and Inhalation) and NJDEP Soil Cleanup Criteria (Impact to Groundwater, Non-Residential Direct Contact and Residential Direct Contact).

Risk assessment results indicate risk in excess of the target carcinogenic risk range of 10^{-4} to 10^{-6} and the target hazard index of 1.0 associated with current and future use exposures to surface and subsurface soils. Primary contributors to these risks include antimony, arsenic and manganese. Also, a qualitative risk characterization indicated potential human health threats due to lead in the surface and subsurface soils.

Sediments

The RAOs for the Delaware River and Crafts Creek sediments include:

- Reduce risk to ecological receptors from exposure to contaminated sediments to acceptable levels;

- Comply with ARARs and TBCs consistent with current and anticipated future use, or request waivers.

The RAOs are based on the results of the ecological risk assessment and a comparison to criteria to be considered for screening and evaluation of sediment quality. Contaminated sediments in the Delaware River and Crafts Creek were identified and delineated as having significant impacts or posing risks to the receptors evaluated as part of the ecological risk assessment. These areas are shown in Figure 5. The criteria used for sediments are based on the most stringent sediment criteria represented between Canadian Low Effects Level (LEL) and Canadian Severe Effects Level (SEL). In the absence of LEL and SEL values, Effects Range - Low (ER-L) and Effects Range - Medium (ER-M) values were used.

Groundwater

The RAOs for the groundwater include:

- Restore the groundwater to drinking water standards within a reasonable time frame and reduce further contamination of groundwater;

- The above RAO was intended; however, EPA has determined that it is technically impracticable to restore the groundwater to meet ARARs and is invoking a Technical Impracticability Waiver for this Site.

The RAOs are based on the results of the baseline risk assessment and a comparison to the federal and State standards for evaluation of groundwater quality. The federal and State standards used for groundwater are based on the most stringent groundwater criteria represented between NJ Groundwater Quality Standard (GWQS) and federal Maximum Contaminant Levels (MCLs). Risk assessment results indicate risk in excess of the target carcinogenic risk range of 10^{-4} to 10^{-6} and the target hazard index of 1.0 associated with future use exposures to groundwater. Primary contributors to these risks include TCE, arsenic, and manganese.

DESCRIPTION OF REMEDIAL ALTERNATIVES

From the screening of technologies and remedial alternatives, EPA evaluated and assembled a range of alternatives for further detailed evaluation. The FS report provides the detailed evaluation for four remedial alternatives for contaminated soils, five remedial alternatives for contaminated sediments, and three remedial alternatives for contaminated groundwater. The Slag Area is also included within the soil alternatives; and, the updated remedial alternative for the Slag Area (SA) is evaluated in the ROD in conjunction with the soil alternatives. Further, a brief description of the existing remedy for the Slag Area specified in the 1991 ROD is provided below.

Common Elements

SOILS

Several of the soil alternatives include common components. Alternatives SA, SL2 and SL3 include the common components of a long-term monitoring program and institutional controls to restrict future excavations through the soil cap and restrict future land uses. More specifically, Alternatives SA and SL3

SUMMARY OF REMEDIAL ALTERNATIVES		
Medium	RI/FS Designation	Description
Slag Area Soils	1991 Selected Remedy (OU3)	Treatment of Hot Spots, and Soil Cap with Stormwater Management System and Shoreline Protection
	Updated Selected Remedy - SA	Based on Updated Predesign Investigation Information on Volume and Cost (Treatment of Hot Spots, and Soil Cap with Stormwater Management System and Shoreline Protection)
Site-Wide Soils (including the Slag Area)	SL1	No Action
	SL2	Limited Action
	SL3	Containment
		Option (a) - Soil/Asphalt
		Option (b) - Soil Only
	SL4	Source Removal/Off-Site Disposal
Sediments	SD1	No Action
	SD2	Limited Action
	SD3	Containment
	SD4	Dredging/Dewatering/Off-Site Disposal
	SD5	Dredging/Dewatering/On-Site Disposal
Groundwater	GW1	No Action
	GW2	Limited Action
	GW3	Containment
	GW4	Restoration (Extraction Wells for Pump-and-Treat)
		Option (a) - Source Removal
		Option (b) - No Source Removal

share long-term maintenance and monitoring of the capped areas, soil capping, stormwater management and erosion controls. Alternatives SA and SL4 share a treatment component for soil and slag material that contain hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Alternatives SA, SL1, SL2 and SL3 require a review of the site conditions every five years since these alternatives would not remove all existing soil contamination.

SEDIMENTS

Several of the sediment alternatives include common components. Alternatives SD2 and SD3 include the common components of a long-term monitoring program and institutional controls to restrict use. Alternatives SD3, SD4 and SD5 share the common components of dredging, dewatering, wetlands restoration and short-term maintenance and monitoring of restored wetlands. Alternatives SD1, SD2 and SD3 require a review of the site conditions every five years since these alternatives would not remove all existing sediment contamination.

GROUNDWATER

Several of the groundwater alternatives include common components. Alternatives GW2 and GW4 include the common components of a long-term monitoring program and institutional controls to restrict groundwater use. Alternatives GW1, GW2 and GW4 require a review of the site conditions every five years since these alternatives would not remove all existing groundwater contamination.

EXISTING SELECTED REMEDY FOR OU3 (SLAG AREA) SPECIFIED IN THE 1991 ROD - Treatment of Hot Spots, and Soil Cap with Stormwater Management System and Shoreline Protection

Volume of slag requiring treatment:	30,000 cy
Estimated Capital Cost:	$6,759,000
Estimated Annual O&M Cost:	$344,000
Estimated Present Worth:	$12,106,000
Estimated Construction Time:	12 months

As part of the 1991 ROD, EPA selected a remedy for the 34-acre Slag Area (OU3). The existing remedy involves treating hot spots, defined as highly-contaminated slag material that fails a TCLP test, prior to covering the entire 34-acre Slag Area with a soil cap and vegetation. The cap would consist of two feet of top soil and vegetation extending to the side slopes. The grading contours of the soil cap would support a stormwater management system that collected and conveyed runoff to the Delaware River while providing improvement in surface water quality. A small portion of the Slag Area that is located in the 100-year flood plain would be graded to above the flood plain elevations. A riprap stone revetment would be placed from the edge of the soil cap down into the surface water to mitigate potential erosion of the shoreline. The slag material in those areas designated as hot spots would be excavated and treated on-site using a mobile treatment unit and placed under the cap. Leachability would be determined by testing the slag material using the TCLP analysis. Stabilization of the slag material would physically or chemically bind contaminants of concern within an insoluble matrix, significantly reducing their potential to leach.

Dewatering of slag material found below the water table would be necessary during its excavation. The extracted water would be collected, treated, and disposed in accordance with federal and State requirements. Since the existing remedy would result in treated material remaining on-site, a long-term groundwater and surface water monitoring program, periodic site inspections, and a review every five years would be required to determine the effectiveness of this remedy. Institutional controls would be implemented to restrict future excavations through the soil cap, especially in those areas that were stabilized. Future land uses would be limited by zoning or deed restrictions, which would be specified in the real estate transactions of the property.

REMEDIAL ALTERNATIVE SA FOR OU3 (SLAG AREA) BASED ON UPDATED PREDESIGN INVESTIGATION INFORMATION ON VOLUME & COST - Treatment of Hot Spots, and Soil Cap with Stormwater Management System and Shoreline Protection

Volume of slag requiring treatment:	210,000 cy
Estimated Capital Cost:	$60,855,000
Estimated Annual O&M Cost:	$344,000
Estimated Present Worth:	$66,146,000
Estimated Construction Time:	30 months

The existing remedy for the Slag Area documented in the 1991 ROD is being re-evaluated to incorporate new information collected during the pre-design investigation conducted after the 1991 ROD and noted above. The major components of the existing remedy for the Slag Area remain the same as noted above, but the volume of hot spot material requiring treatment has significantly increased. The 1991 ROD estimate of slag material requiring treatment was increased from 30,000 cy to 210,000 cy for this alternative, thereby increasing the estimated capital costs from $6,759,000 (1991 ROD estimate) to $60,854,000 (1997 pre-design investigation cost estimate).

The analytical results from the hot spot delineation, and the groundwater, surface water and sediment investigations indicate that the metal contamination present in the slag material and groundwater does not show a significant impact on the biota in the sediments and the quality of the surface water. Samples indicating groundwater contamination are primarily a result of sampling less-mobile naturally occurring particulates with adsorbed metals contamination or other contaminated particulate matter, and to a much lesser degree, more mobile, dissolved metals contamination resulting from leaching. For these reasons, it was decided that for the Site, the TCLP test used as a basis for the 1991 ROD, was not a good indicator of hot spots in the Slag Area and instead, the aforementioned sediment, surface water, and groundwater sampling would be more relevant.

REMEDIAL ALTERNATIVES FOR OU5 (SOILS (INCLUDING THE SLAG AREA), SEDIMENT, & GROUNDWATER)

SOIL ALTERNATIVES

Alternative SL1: No Action

Estimated Capital Cost:	$0
Estimated Annual O&M Cost:	$0
Estimated Present Worth:	$54,000
Estimated Construction Time:	None

CERCLA and the NCP require the evaluation of No Action as a baseline to which other alternatives are compared. No active remediation or containment of any contamination associated with the soils would be performed. However, this alternative would include five-year reviews of site data as required by CERCLA for sites where contamination remains after initiation of the remedial action.

Alternative SL2: Limited Action

Estimated Capital Cost:	$1,731,000
Estimated Annual O&M Cost:	$318,000
Estimated Present Worth:	$5,869,000
Estimated Construction Time:	6-12 months

This alternative would consist of a long-term monitoring program, installation of site security measures (i.e., repair fencing and maintaining security guards) and institutional controls (i.e., restrictions on land use in the form of a deed notice). Periodic site inspections would be implemented to assess the potential migration of contaminants. CERCLA requires that if a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, EPA must review the action no less often than every five years after initiation of the action. Because contamination would be left in place under this alternative, a review of the remedy every five years would be required.

Alternative SL3: Containment

Estimated Capital Cost:	\$20,092,000 (Option a)
	\$16,839,000 (Option b)
Estimated Annual O&M Cost:	\$212,000 (Option a)
	\$178,000 (Option b)
Estimated Present Worth:	\$24,422,000 (Option a)
	\$20,479,000 (Option b)
Estimated Construction Time:	1-2 years (Options a or b)

This alternative includes containment of site-wide contaminated soils, including the Slag Area, by capping. Two distinct capping options are considered based on the physical characteristics of different portions of the Site, and the current and potential future uses of each portion, option (a) soil/asphalt, and option (b) soil only. These options are presented to demonstrate the range of possibilities, recognizing that the final capping plan may fall somewhere in between these two options. Option (a) would be appropriate for a mixed recreational and commercial use scenario in which some of the buildings on the Site would remain, and the asphalt capping would minimize grade changes and maintain access to buildings. Areas on the perimeter of the Site, where grade changes would be less disruptive to site operations, would be capped using approximately two feet of soil. Option (b) would be appropriate for a recreational use scenario in the event that all buildings on the Site were demolished. Additional investigations, remediation measures, and institutional controls would be needed for residential use scenarios.

For Option (a), the total area to be capped with soil cap in the main plant area is 414,000 square yards (86 acres) and would consist of approximately 1.5 feet of clean fill and six inches of top soil to support vegetation. Asphalt cap areas would cover approximately 178,000 square yards (37 acres) and would consist of approximately six inches of gravel subbase and four to six inches of asphalt. For Option (b), the total area to be capped with soil cap is 592,000 square yards (123 acres). The total area to be capped with soil cap in the Slag Area is 165,000 square yards (34 acres), for both Options (a) and (b). The total volumes of clean fill and topsoil for the main plant capping are 207,000 cy and 69,000 cy, respectively, for Option (a), and 296,000 cy and 99,000 cy, respectively, for Option (b). The

total volumes of clean fill and top soil for the Slag Area capping are 83,000 cy and 28,000 cy for both Options (a) and (b).

Compaction, intermediate and final grading would be performed as required by the cap designs. Any soil AOCs that may be identified during implementation of OU4 would be properly delineated and remediated prior to capping activities. A permeable liner would be placed beneath the cap to act as a visible marker to minimize direct contact should the overlying cap be breached. Soil cap areas would be vegetated to prevent erosion of the soils. The areas to be capped are generally not steep slopes except for the Slag Area. Stormwater management and erosion controls would be determined during the design phase for the main plant area and are already planned for the Slag Area. This alternative would require long-term maintenance and monitoring of the capped areas. Institutional controls would be implemented to restrict future excavations through the soil cap and future land uses would be limited by zoning or deed notice. CERCLA requires that if a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, EPA must review the action no less often than every five years after initiation of the action. Because contamination would be left in place under this alternative, a review of the remedy every five years would be required.

Alternative SL4: Source Removal/Off-Site Disposal

Estimated Capital Cost:	$649,931,000
Estimated Annual O&M Cost:	$0
Estimated Present Worth:	$649,931,000
Estimated Construction Time:	2-3 years

This alternative consists of the excavation of all contaminated soils and slag material above cleanup levels, off-site disposal and site restoration. Contaminated soils and slag material would be excavated using conventional construction techniques. It is estimated that the total volume of soil to be excavated in the main plant area is 860,000 cy. The total volume of slag to be excavated is approximately 710,000 cy. The volume estimate for the main plant was based on an excavation depth of four to ten feet, where the volume estimate for the Slag Area was based on the entire volume due to limited analytical data. It is assumed that 30 percent of excavated soil and slag material would be characteristic hazardous waste based on the exceedence of the TCLP limits for inorganics (i.e., lead and cadmium). This hazardous waste would require treatment to render it non-hazardous prior to disposal, because of RCRA Land Disposal Restrictions (LDRs).

Site restoration would consist of backfilling all excavations with clean fill to within six inches of original grade, placement of approximately six inches of top soil and revegetation to stabilize the soils. The areas to be backfilled are generally not steep slopes except for the Slag Area. Stormwater management and erosion controls would be determined during the design phase for both the main plant area and the Slag Area.

SEDIMENT ALTERNATIVES

Alternative SD1: No Action

Estimated Capital Cost:	$0
Estimated Annual O&M Cost:	$0
Estimated Present Worth:	$54,000
Estimated Construction Time:	None

CERCLA and the NCP require the evaluation of No Action as a baseline to which other alternatives are compared. No active remediation or containment of any contamination associated with the sediments would be performed. However, this alternative would include five-year reviews of site data as required by CERCLA for sites where contamination remains after initiation of the remedial action.

Alternative SD2: Limited Action

Estimated Capital Cost:	$21,000
Estimated Annual O&M Cost:	$47,000
Estimated Present Worth:	$656,000
Estimated Construction Time:	6-12 months

This alternative would consist of a long-term sediment monitoring program, installation of site security measures (i.e., repair fencing) and restrictions on land use in the form of a deed notice. Periodic site inspections would be implemented to assess the potential migration of contaminants. A long-term sediment monitoring program would be developed to ensure that risks resulting from on-site contamination do not increase. CERCLA requires that if a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, EPA must review the action no less often than every five years after initiation of the action. Because contamination would be left in place under this alternative, a review of the remedy every five years would be required.

Alternative SD3: Containment

Estimated Capital Cost:	$4,218,000
Estimated Annual O&M Cost:	$62,000
Estimated Present Worth:	$5,144,000
Estimated Construction Time:	1 year

This alternative includes containment of contaminated sediments by capping. Contaminated sediments near the Site cover a total of approximately 87,000 square yards or 18 acres, and are mostly in wetland areas that need to be maintained or restored to their original value and function after remediation. Further delineation of the impacted areas would be conducted during the design phase. In order to maintain the current grade, approximately 18 inches of existing sediments would be removed by dredging. This would allow placement of the cap without significantly changing existing elevations. The cap would consist of a minimum of six inches of compacted soil with a minimum one foot of a sandy loam soil and organic matter capable of supporting wetland vegetation. Capped areas would be vegetated to restore the wetlands. Appropriate measures would be implemented to control contaminant migration from sediments. Specific details for dredging and sediment erosion control would be developed during the design phase. The resulting excavated sediments with a total volume of approximately 43,500 cy would be disposed of off-site or on-site. This alternative would require long-term maintenance and monitoring of the capped areas. CERCLA requires that if a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, EPA must review the action no less often than every five years after initiation of the action. Because contamination would be left in place under this alternative, a review of the remedy every five years would be required.

Alternative SD4: Dredging/Dewatering/Off-Site Disposal

Estimated Capital Cost:	$19,279,000
Estimated Annual O&M Cost:	$0
Estimated Present Worth:	$19,279,000
Estimated Construction Time:	1-2 years

This alternative consists of dredging all contaminated sediments, dewatering the dredged sediments, off-site disposal, and site restoration. The area of sediments requiring excavation is the same as discussed in Alternative SD3. Further delineation of the impacted areas would be conducted during the design phase. The objective of the sediment remediation is to remove all loose silty materials down to the hard stream/river bottom in the contaminated area to remove the potential of exposure to ecological receptors. The actual depths of contaminated sediment may vary significantly. Confirmatory sampling will be conducted to ensure that contaminants are not present in the river bottom. Using a depth of four feet, the total volume of sediments to be dredged is estimated at 116,000 cy. Dredged areas would be restored by placement of a sandy loam soil with organic matter and revegetated to establish wetlands whose function and value are at least equal to the existing wetlands. Appropriate measures would be implemented during dredging to control contaminant migration from sediments. Specific details for dredging and sediment erosion control would be developed during the design phase.

Dredged material would be managed based on the characterization after dredging. The dredged materials would be dewatered prior to being transported off-site for disposal at a non-hazardous landfill or other approved dredge spoil disposal location. Results from the RI report indicate that sediments to be dredged contain concentrations of constituents that exceed ecological benchmarks and pose a risk to ecological receptors, but are below the standards that would characterize the sediments as RCRA hazardous waste for disposal purposes. Water recovered from the dewatering operation would be treated and discharged appropriately in accordance with all applicable requirements.

Alternative SD5: Dredging/Dewatering/On-Site Disposal

Estimated Capital Cost:	$11,354,000
Estimated Annual O&M Cost:	$0
Estimated Present Worth:	$11,354,000
Estimated Construction Time:	1-2 years

Alternative SD5 incorporates the basic components of the SD4, in terms of dredging and dewatering, however, this alternative proposes disposal of the sediments on-site. Based on limited data, it is assumed that the excavated sediments would be non-hazardous and therefore would not require treatment prior to on-site disposal. An estimated volume of 116,000 cy would be placed on-site. The design phase would consider the placement of this extra volume of material with respect to stormwater management, erosion control and flood plain elevations.

GROUNDWATER ALTERNATIVES

EPA plans to conduct a comprehensive pre-design investigation for groundwater, groundwater seeps, surface water, sediments, soil and AOCs to provide a current and complete set of data and further assess groundwater metals impact to the river from both the Slag Area and site-wide soils. This investigation will serve to evaluate and confirm our current conclusions. If future monitoring indicates different conclusions, EPA can re-evaluate the groundwater at that time.

Alternative GW1: No Action

Estimated Capital Cost:	$0
Estimated Annual O&M Cost:	$0
Estimated Present Worth:	$54,000
Estimated Construction Time:	None

CERCLA and the NCP require the evaluation of No Action as a baseline to which other alternatives are compared. No active remediation or containment of any contamination associated with the groundwater would be performed. However, this alternative would include five-year reviews of site data as required by CERCLA for sites where contamination remains after initiation of the remedial action.

Alternative GW2: Limited Action

Estimated Capital Cost:	$15,000
Estimated Annual O&M Cost:	$50,000
Estimated Present Worth:	$686,000
Estimated Construction Time:	6-12 months

This alternative consists of a long-term groundwater monitoring program and restrictions on groundwater use in the form of a deed notice or a Classification Exception Area (CEA). A monitoring program would be developed to ensure that risks resulting from on-site contamination do not increase. The monitoring program would include collecting samples from monitoring wells using low flow sampling techniques. Monitoring of sediment and surface water quality would also be incorporated into the long-term monitoring plan if it is established during the pre-design investigations that the groundwater is an ongoing source of contamination to sediments and/or surface water.

Periodic site inspections would be implemented to assess the potential migration of contaminants. CERCLA requires that if a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, EPA must review the action no less often than every five years after initiation of the action. Because contamination would be left in place under this alternative, a review of the remedy every five years would be required.

Alternative GW3: Containment

The FS report did not retain this groundwater alternative for a detailed evaluation as was done for the other three remedial alternatives since only a portion of the contaminated groundwater would be controlled and treated based on this alternative. Furthermore, extra costs would be incurred, in comparison to GW4, because of the cutoff wall construction specified for this alternative.

Alternative GW4: Restoration (Extraction Wells for Pump-and-Treat)

Estimated Capital Cost:	$3,455,000
Option (a) - Costs for Source Removal (Soil & Slag)	$649,931,000
Estimated Annual O&M Cost:	$768,000
Estimated Present Worth:	$13,043,000
Estimated Construction Time:	1 year
Estimated Time to Achieve RAOs:	

Option (a) - Thousands of years (with source removal and restoration)
Option (b) - Cannot achieve RAOs (with no source removal and restoration)

This alternative includes groundwater restoration via extraction wells and a pump-and-treat system and a long-term monitoring program to assess the continuous operation of the treatment measures. Approximately 15 extraction wells would be installed in the vicinity of the Slag Area, along the Delaware River shoreline between Outfalls #4 and #7, and in the southeastern portion of the Site. The contaminated groundwater would be pumped at a combined rate of 93 gallons per minute (gpm) from both the upper and lower aquifers. The extracted contaminated groundwater would be collected in a storage tank and treated at an on-site treatment plant to meet the standards required for discharge to surface water or to a local Publicly Owned Treatment Works (POTW). The treatment system would include several process options for the removal of certain contaminants. Initially, chemical precipitation and filtration would be used to remove the inorganic compounds, followed by carbon adsorption for the removal of low-level organics. Two options are associated with this alternative: Option (a) - source removal and Option (b) - no source removal. Source removal consists of excavating all of the impacted soils from the main plant area and all of the material in the Slag Area, as described in Alternative SL4. The groundwater modeling results indicate that it will take thousands of years for the lower aquifer to reach groundwater cleanup standards under Option (a) and groundwater cleanup standards would not be achieved under Option (b).

COMPARATIVE ANALYSIS OF ALTERNATIVES

In selecting the remedy, EPA considered the factors set out in CERCLA §121, 42 U.S.C. §9621, by conducting detailed analysis of the viable remedial alternatives pursuant to the NCP, 40 CFR §300.430(e)(9) and OSWER Directive 9355.3-01. The detailed analysis consisted of an assessment of the individual alternatives against each of nine evaluation criteria and a comparative analysis focusing upon the relative performance of each alternative against those criteria. In addition, the soils evaluation will include an analysis of the treatment component (stabilization) in the existing selected remedy for the Slag Area. The other components of the existing selected remedy for the Slag Area would remain the same. The nine evaluation criteria are discussed below.

Threshold Criteria *- The first two criteria are known as "threshold criteria" because they are the minimum requirements that each response measure must meet in order to be eligible for selection as a remedy.*

1. **Overall Protection of Human Health and the Environment**
Overall protection of human health and the environment addresses whether or not a remedy provides adequate protection and describes how risks posed through each exposure pathway (based on a reasonable maximum exposure scenario) are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

SOILS

Alternatives SL3, SL4 and SA achieve the remedial action objectives of protecting human health and ecological receptors by preventing exposure to contaminated soil and slag. Alternatives SL4 and SA are more aggressive strategies than SL3. Alternative SL4 would achieve the remedial action objectives through complete removal of contaminated material, thereby providing the greatest protection of human health and the environment.

Alternative SA would achieve the remedial action objectives through treatment of hot spots and capping in the Slag Area, which the 1991 ROD cited as a source of the groundwater contamination. However, based on the Predesign Investigation Report (PIR) and the groundwater modeling effort, treatment of hot spots in the Slag Area would not necessarily reduce the leaching of contaminants into the groundwater because most of the groundwater contamination principally results from suspended particulates, and to a much lesser degree, as the result of leaching.

Alternative SL2 relies on institutional controls to improve overall protection of human heath and the environment, most of which are already in place. However, SL2 would not be as protective of the environment as Alternatives SL3 or SL4 since it would not prevent the potential for contaminant migration and the potential of birds and small mammals from making direct contact with contaminated soils on-site. No remedial action objectives are achieved by Alternative SL1.

SEDIMENTS

Alternative SD3 achieves the remedial action objectives of protecting human health and ecological receptors by preventing exposure to contaminated sediments and restoring ecologically sensitive areas. Alternatives SD4 and SD5 would achieve the remedial action objectives through dredging and dewatering of contaminated sediments that would significantly reduce the toxicity, mobility or volume of contaminants in the sediments. The sediments are disposed of off-site and on-site under Alternatives SD4 and SD5, respectively. Alternative SD2 relies on institutional controls to improve overall protection of human heath and ecological receptors. However, SD2 would not protect ecological receptors from exposure to contaminated sediments. No remedial action objectives are achieved by Alternative SD1.

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GROUNDWATER

Alternative GW4 (Option a) would achieve the remedial action objectives by extraction and treatment of the groundwater and would be protective of human health and the environment. Also, by using Option (a) with GW4 to remove contaminated sources, the remedial action objectives would be further achieved by preventing direct contact with and exposure to the soils and slag material.

However, Alternative GW4 (Option a) would not provide a significant increase in protectiveness until the cleanup levels are reached, estimated to take thousands of years. Alternative GW2 relies on institutional controls to improve overall protection of human health by providing control of the exposure pathway. Alternative GW2 would not mitigate the ecological risks associated with groundwater. However, analysis of the current site conditions indicate that the metals may be migrating from soils to sporadically located areas of the groundwater, but the subsequent groundwater transport of metals to the surface water appears to be limited. Additionally, historical data show sediments were impacted predominantly from outfall discharges and there is no definitive evidence that ecological impacts resulted from contaminated groundwater discharging to the Delaware River. Alternative GW2 would include long-term monitoring of sediments and surface water to determine if groundwater is causing unacceptable impacts. No remedial action objectives are achieved by Alternative GW1.

2. **Compliance with applicable or relevant and appropriate requirements (ARARs)**

Section 121(d) of CERCLA and NCP §300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations which are collectively referred to as "ARARs", unless such ARARs are waived under CERCLA section 121(d)(4).

Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those State standards that are identified by a state in a timely manner and that are more stringent than Federal requirements may be applicable. Relevant and appropriate requirements are those *cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site. Only those State standards that are identified in a timely manner and are more stringent than Federal requirements may be relevant and appropriate. Compliance with ARARs addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of other Federal and State environmental statutes or provides a basis for invoking a waiver.*

SOILS

Alternative SL4 would meet chemical-specific TBCs, such as EPA SSLs and NJDEP Soil Cleanup Criteria, through removal, and Alternative SA would partially achieve chemical-specific TBCs through treatment. Alternative SL3 would not achieve chemical-specific TBCs, however, it would provide protection through containment. Alternatives SL1 and SL2 would not achieve chemical-specific TBCs. Alternatives SL3, SL4 and SA would meet location-specific ARARs. All alternatives would comply with RCRA and related state regulations applicable to the technologies being utilized. A complete list of ARARs/TBCs may be found in Section 2 of the FS report, and Table 36 of Appendix II of this ROD.

SEDIMENTS

Alternatives SD4 and SD5 would most aggressively meet chemical-specific TBCs, followed by Alternative SD3. Alternatives SD1 and SD2 would not achieve chemical-specific TBCs. All alternatives would be expected to comply with federal and State location-specific ARARs that regulate excavation, filling, and discharge into wetlands and floodplains. All alternatives would be expected to comply with RCRA and related state regulations applicable to the technologies being utilized. A complete list of ARARs/TBCs may be found in Section 2 of the FS report, and Table 36 of Appendix II of this ROD.

GROUNDWATER

Alternative GW4 attempts to achieve compliance with chemical-specific ARARs since the contaminated groundwater would be removed and treated, however, it would take thousands of years and it is not clear whether the goal to achieve ARARs can even be met. In addition, GW4 would meet location- and action-specific ARARs, such as wetlands or discharge limits. Alternative GW1 and GW2 would not achieve compliance with chemical-specific ARARs since contaminants are not removed to cleanup levels, however, Alternative GW2 would achieve compliance with location- and action specific ARARs. Since Alternative GW4 will not achieve chemical-specific ARARs, EPA is invoking an ARAR waiver due to technical impracticability for the groundwater at the Site.

Primary Balancing Criteria - The next five criteria are known as "primary balancing criteria". These criteria are factors with which tradeoffs between response measures are assessed so that the best option will be chosen, given site-specific data and conditions.

3. **Long-term Effectiveness and Permanence**

Long-term effectiveness and permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met. It also addresses the magnitude and effectiveness of the measures that may be required to manage the risk posed by treatment residuals and/or untreated wastes.

<u>SOILS</u>

Alternative SL4 uses source removal for contaminated soils and slag, which is a complete and permanent means of preventing direct contact exposure. Alternative SL3 would effectively minimize the public exposure by using soil and asphalt capping, such that long-term performance of the soil and asphalt caps could be maximized by proper maintenance, inspection and monitoring. Alternatives SL1 and SL2 do not include any measures for containing or treating the contaminated soils, and the control measures are not considered reliable in the long-term. The magnitude of residual risks are significantly reduced for Alternative SL4 through removal and Alternative SA through on-site treatment, considerably reduced for Alternative SL3 through containment, and highest for Alternatives SL1 and SL2.

Under Alternative SA, long-term permanence is further enhanced by removing contaminants from the slag material to acceptable levels through stabilization, however, treatability studies would be necessary to ensure contamination could be reduced to acceptable levels. Even though unanticipated, some inorganic leaching may occur if the stabilized slag material matrix deteriorates. This alternative may offer slightly more protection by stabilizing a portion of the slag material, however, this alternative would not impact the migration pathway of suspended particulates from untreated slag material below the water table. Considerable confirmatory sampling would be necessary to ensure that all the hot spot slag material was excavated for treatment, and as a result, the volume of hot spot material may increase beyond the design limits.

SEDIMENTS

Alternatives SD4 and SD5 eliminates the risk associated with contaminated material from the sediments through dredging, disposal and restored with placement of sandy loam soil. Under Alternative SD5, sampling of the dredged sediments would be performed to assure safe on-site disposal. Alternative SD3 uses capping of contaminated sediments, which is an effective means of preventing exposure, but would be subject to erosion and therefore may not be as effective over the long-term. Alternatives SD1 and SD2 do not include any measures for containing or dredging the contaminated sediments, and the control measures are not considered reliable in the long-term. The magnitude of residual risks are significantly reduced for Alternatives SD4 and SD5, and highest for Alternatives SD1, SD2 and SD3.

GROUNDWATER

Alternative GW4 extracts and treats the contaminated groundwater, thereby eliminating a larger volume of the contaminants. By employing Option (a) as part of GW4, long-term effectiveness would also be achieved, since the source areas would be removed permanently from the Site. However, reduction of contaminant concentrations in the groundwater would not be obtained within a reasonable time frame due to the significant difficulty in extracting the inorganics from the aquifer. Alternative GW2 relies on water use restrictions as control measures and long-term monitoring to ensure protectiveness of the ecological systems. All alternatives would include periodic five-year reviews. The magnitude of residual risk is highest for Alternatives GW1, GW2 and significantly reduced for Alternative GW4 over an unreasonable time frame.

4. **Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment**

Reduction of toxicity, mobility, or volume through treatment refers to a remedial technology's expected ability to reduce the toxicity, mobility, or volume of hazardous substances, pollutants or contaminants at the site.

SOILS

The greatest reduction of toxicity, mobility, and volume of contaminants would be achieved by Alternative SL4 where the soil and slag material are entirely removed from the Site. Alternative SL3 reduces mobility of the contaminants by minimizing erosion and infiltration of rainfall, thereby reducing the quantity of water percolating through the soils and slag material. The contours of the cap and the stormwater management system would minimize ponding and promote efficient runoff of stormwater. Alternative SA also reduces mobility of contaminants in a portion of the Slag Area through treatment and does not generate treatment residues. This alternative would not directly affect the intrinsic toxicity and would increase the volume of the treated slag material. Alternatives SL1 and SL2 provide no reduction in the toxicity, mobility, or volume of contaminants in the soils.

SEDIMENTS

The greatest reduction of toxicity, mobility, and volume of contaminants would be achieved by Alternatives SD4 and SD5, where contaminated sediments are removed through dredging and disposed either off-site or on-site, respectively. Alternatives SD4 and SD5 would similarly reduce the mobility and volume of contaminants that may impact ecological sensitive areas. For Alternative SD5, the low-level contaminated sediments would be placed on-site and capped to prevent direct contact. Alternative SD3 reduces the mobility of the contaminants by capping the sediments. The cap would have to be properly maintained to assure the protectiveness of this alternative. Alternatives SD1 and SD2 provide no reduction in the toxicity, mobility, or volume of contaminants in the sediments.

GROUNDWATER

Alternative GW4 would attempt to reduce toxicity, mobility, and volume of the contaminants via removal and the groundwater treatment system, however, this would occur over an unreasonable time frame. If Option (a) is used in conjunction with GW4, then the toxicity, mobility and volume of soil contamination would also be reduced through source removal. Alternatives GW1 and GW2 provide no reduction in the toxicity, mobility or volume of contaminants at the Site. However, analysis of the current site conditions indicate that the metals may be migrating from soils to sporadically located areas of the groundwater, but the subsequent groundwater transport of metals to the surface water appears to be limited.

5. **Short-term Effectiveness**

Short-term effectiveness addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation periods until cleanup goals are achieved.

SOILS

Potential risks to workers associated with the disturbance of the site soils and slag material would be mitigated through the use of established safe-work practices and appropriate personal protective equipment. Potential risks to workers would be negligible for Alternatives SL1 and SL2, slightly greater for Alternative SL3, and greatest for Alternative SL4 associated with the major earthmoving activities. The increasing potential impact would be created through increased construction activity and increased exposure due to larger volumes of contaminated material excavated and handled. These risks would be minimized by using appropriate dust suppression measures. Alternative SA could create some additional low-level particulate emissions from the on-site treatment operations. Monitoring would be used to ensure that no airborne contamination migrates from the Site. Off-site impacts to the neighboring community would include possible dust emissions and truck traffic associated with heavy construction activities and the transport of materials on-site and off-site. For Alternative SL4, clearing, trenching, and source removal would impact wildlife habitats for a brief time; however, these areas would be restored as part of the remediation.

Alternatives SL3, SL4 and SA would achieve remedial action objectives, and could be implemented in the following time frames. The time frame for SL4 is based the availability of off-site disposal facilities willing to accept excessive volumes of soil and slag material. Alternatives SL1 and SL2 could be implemented within several months, however, they would not achieve remedial action objectives.

Alternative SL1	-	no construction time
Alternative SL2	-	6-12 months
Alternative SL3	-	1-2 years
Alternative SL4	-	2-3 years
Alternative SA	-	2-3 years

SEDIMENTS

Potential risks to workers would be negligible for Alternatives SD1 and SD2, slightly greater for Alternatives SD3, and greatest for Alternatives SD4 and SL5. The increasing potential impact would be created through increased construction activity and increased exposure due to larger volumes of contaminated material dredged and handled. These risks would be minimized by using appropriate engineering controls, personal protective equipment, and safe work practices. Alternative SD4 would increase truck traffic due to hauling of contaminated sediments off-site and clean fill material on-site. For Alternatives SD3 through SD5, dredging would impact wildlife habitats for a brief time; however, these areas would be restored as part of the remediation.

Alternatives SD4 and SD5 would achieve remedial action objectives, and could be implemented in an estimated two to three years. Alternative SD3 is expected to require two years to complete. Alternatives SD1 and SD2 could be implemented within several months, however, they would not achieve remedial action objectives.

Alternative SD1	-	no construction time
Alternative SD2	-	6-12 months
Alternative SD3	-	2 years
Alternative SD4	-	2-3 years
Alternative SD5	-	2-3 years

GROUNDWATER

Potential risks to workers would be negligible for Alternatives GW1 and GW2, and the greatest for Alternative GW4. The increased potential impact to workers and area residents for Alternative GW4 would be created through increased construction activity and increased exposure to contaminated groundwater associated with the on-site treatment processes. These risks would be minimized by using appropriate engineering controls, personal protective equipment, and safe-work practices. Alternative GW4 would increase truck traffic due to hauling of contaminated soil and slag material off-site and clean fill material on-site associated with Option (a). For Alternative GW4, clearing, trenching, and source removal would impact wildlife habitats for a brief time; however, these areas would be restored as part of the remediation.

Alternative GW4 (Option a) would achieve remedial action objectives over a period of thousands of years, and could be constructed within one year. Alternatives GW1 and GW2 could be implemented within several months, however, they would not achieve remedial action objectives.

Alternative GW1	-	no construction time
Alternative GW2	-	6-12 months
Alternative GW4	-	1 year (construction time)
(Option a)	-	Thousands of years (time to achieve RAOs)

6. **Implementability**
Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

SOILS

Alternatives SL1 through SL4 are technically and administratively feasible. In general, no major construction concerns are associated with any of the alternatives. Services and materials for all alternatives are readily available. However, the availability of off-site disposal facilities willing to accept excessive volumes of soil and slag material and the availability of excessive volumes of clean backfill to restore the area associated with Alternative SL4 may be limited. Additionally with Alternative SL4, it may be difficult to control the water table or river water encountered during excavations throughout the Site. This may involve pumping water from excavations or dewatering soils from the deeper excavations.

Alternative SA uses a treatment technology, in which treatability studies would need to occur during the design phase to optimize operating parameters. Extensive analyses would need to be performed to determine the implementation parameters for this alternative. The stabilization of soil contaminated with metals is an easily implemented and proven technology. However, the stabilization of hot spot areas would be technically difficult due to the massive volume and the physical nature of material requiring treatment. Excavating and backfilling a large volume of slag fill for treatment would be technically difficult because of the close proximity of the water table and river water, as discussed above. Alternative SA would require pretreatment processing (crushing, sorting, and screening) of large chunks of slag, iron deposited piles, and other debris, to ensure the slag material is suitable to undergo stabilization. Because of the large land area, the pretreatment process could be a fairly substantial activity.

SEDIMENTS

For Alternatives SD1 and SD2, no constructability concerns exist. Services and materials for all alternatives are readily available, as are appropriate off-site disposal facilities. Alternative SD3 would require careful construction to effectively place the cap and vegetation so as to prevent erosion. Alternative SD4 would have requirements for the transporting of waste off-site. Alternatives SD3 through SD5 would have to meet substantive requirements for dredging of sediments.

GROUNDWATER

Alternative GW4 uses demonstrated and proven treatment technologies. Some engineering studies would need to occur during the design phase to optimize operating parameters. The availability of off-site disposal facilities willing to accept excessive volumes of soil and slag material associated with Option (a) may be limited. For Alternatives GW1 and GW2, no constructability concerns exist. All of the alternatives would include periodic reviews and inspection as a means of monitoring the effectiveness of the remedy.

7. **Cost**
Includes estimated capital and operation and maintenance costs, and net present-worth values.

SOILS

The estimated present worth costs range from $54,000 for Alternative SL1 to $649,931,000 for Alternative SL4. In evaluating cost effectiveness between Alternatives SL3, SL4 and SA, Alternative SL3 ($20,479,000 - 24,422,000) is the most cost effective, as it satisfies the remedial action objectives at the least cost, and removes the risks associated with the potential exposure to contaminated soil. Both Alternatives SL4 and SA are inordinately high costing alternatives that are more protective since the contaminants would be removed from the Site or made unavailable through treatment. Alternative SL1 is the lowest cost but provides no additional protection of human health and the environment. Alternative SL2 is the next lowest cost alternative and provides minimal reduction of risk to human health and no protection of the environment. The present-worth costs are as follows:

	TOTAL	MAIN PLANT AREA	SLAG AREA
Alternative SL1	- $54,000	$42,000	$12,000
Alternative SL2	- $5,869,000	$4,590,000	$1,279,000
Alternative SL3			
(Option a)	- $24,422,000	$17,522,000	$6,900,000
(Option b)	- $20,479,000	$14,439,000	$6,040,000
Alternative SL4	- $649,931,000	$355,095,000	$294,836,000
Alternative SA	- $66,146,000 (1997 cost estimate)		

SEDIMENTS

The estimated present worth costs range from $54,000 for Alternative SD1 to $19,279,000 for Alternative SD4. In evaluating cost effectiveness between Alternatives SD3 through SD5, Alternative SD5 ($11,354,000) is the most cost effective alternative that satisfies the remedial action objectives by preventing exposure to contaminated sediments and restoring ecological sensitive areas. Alternative SD3 would be more cost effective than Alternative SD5, however, effectiveness in the long-term would have to be demonstrated. Alternative SD1 is the lowest cost but provides no additional protection of human health and the environment. Alternative SD2 is the next lowest cost alternative and provides minimal reduction of risk to human health and no protection of the environment.

Alternative SD1	-	$54,000
Alternative SD2	-	$656,000
Alternative SD3	-	$5,144,000
Alternative SD4	-	$19,279,000
Alternative SD5	-	$11,354,000

GROUNDWATER

The estimated present worth costs range from $54,000 for Alternative GW1 to $13,043,000 for Alternative GW4. In evaluating cost effectiveness between Alternatives GW2 and GW4, Alternative GW2 ($686,000) is the most cost effective alternative that satisfies the remedial action objectives by preventing human exposure to contaminated groundwater and monitoring ecological sensitive areas. Alternative GW4 (Option a) would take thousands of years to satisfy the remedial action objectives; thus the increased cost would be unwarranted. Additionally, the cost of complete source removal, which is critical to the success of complete groundwater restoration, is inordinately high ($649,931,000) and not cost effective.

Alternative GW1	-	$54,000	
Alternative GW2	-	$686,000	
Alternative GW4	-	$13,043,000	
(Option a)	-	$649,931,000	(Additional Costs for Source Removal of Soil & Slag)

***Modifying Criteria** - The final two evaluating criteria, criteria 8 and 9, are called "modifying criteria" because new information or comments from the state or the community on the Proposed Plan may modify the preferred response measure or cause another response measure to be considered.*

8. **State Acceptance**

State acceptance indicates whether, based on its review of the RI/FS reports and the Proposed Plan, the state supports, opposes, and/or has identified any reservations with the selected response measure.

The NJDEP supports the Selected Remedy for the soils (Soil Alternative 3), sediments (Sediment Alternative 5), and groundwater (Groundwater Alternative 2). The NJDEP also supports

the amendment of the Existing Selected Remedy for the Slag Area (treatment of hot spots, and soil cap with stormwater management system and shoreline protection), as specified in the 1991 ROD, to the selected remedy for the soil (soil cap with stormwater management system and shoreline protection).

9. **Community Acceptance**

Community acceptance summarizes the public's general response to the response measures described in the Proposed Plan and the RI/FS reports. This assessment includes determining which of the response measures the community supports, opposes, and/or has reservations about.

EPA solicited input from the community on the remedial alternatives proposed for the Roebling Steel Site. The attached Responsiveness Summary addresses the comments received during the public comment period. Both the local officials and residents were generally supportive of EPA's Proposed Plan.

PRINCIPAL THREAT WASTE

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP Section 300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund site. A source material is material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to groundwater, surface water or air, or acts as a source for direct exposure. Contaminated groundwater generally is not considered to be a source material; however, Non-Aqueous Phase Liquids (NAPLs) in groundwater may be viewed as source material. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of the alternatives using the nine remedy selection criteria. This analysis provides a basis for making a statutory finding that the remedy employs treatment as a principal element.

The principal threats posed by the Site consist mainly of waste products and materials from the steel manufacturing process that have contaminated the soils, sediments and groundwater. These sources of contamination, also referred to as areas of concern (AOCs), will be remediated as part of the OU4 building cleanup. The AOCs that have already been remediated are the following: aboveground and underground storage tanks, friable asbestos, process dust, the contents of pits and sumps, underground oil and chemical lines, soils contaminated with oil, and the landfill. Certain areas of the Site have been investigated (trenching of soils) to search for AOCs. EPA continues to work on the cleanup of the buildings and contamination sources. Any soil AOCs that may be identified during implementation of OU4 would be properly delineated and remediated prior to capping activities.

SELECTED REMEDY

Based upon consideration of the results of the site investigations, the requirements of CERCLA, the detailed analysis of the response measures, and public comments, EPA has determined that Soil Alternative 3, Sediment Alternative 5 and Groundwater Alternative 2 are the appropriate remedy components for the Site, because they best satisfy the requirements of CERCLA §121 and the NCP's nine evaluation criteria for remedial alternatives, 40 CFR §300.430(e)(9). This remedy is comprised of the following components:

Soils

- Capping of site-wide contaminated soil, including the Slag Area. Two distinct capping options are considered based on the physical characteristics of different portions of the

Site, and the current and potential future uses of each portion, Option (a) soil/asphalt, and Option (b) soil only;

- The cap will support a stormwater management system and erosion controls along the shoreline;

- Implement a long-term maintenance and monitoring program to ensure the integrity of the capped areas; and,

- Institutional controls to restrict future excavations through the soil cap and future land uses will be limited by zoning or deed notice.

Under Alternative SL3, Option (a), a soil/asphalt cap, is protective for a mixed recreational and commercial use scenario and Option (b), a soil-only cap, is protective for a recreational use scenario. Additional investigations, remediation measures, and institutional controls will be needed for residential use scenarios. The soil cap will consist of approximately 1.5 feet of clean fill and six inches of top soil to support vegetation. The asphalt cap will consist of approximately six inches of gravel subbase and four to six inches of asphalt. A permeable liner will be placed beneath the cap to act as a visible marker to minimize direct contact should the overlying cap be breached. Any soil AOCs that may be identified during implementation of OU4 will be properly delineated and remediated prior to capping activities.

Sediments

- Dredging of the contaminated sediments found in the Delaware River and Crafts Creek;

- Dewatering and capping of the dredged sediments on-site; and,

- Backfill by placement of a sandy loam soil with organic matter and restoration of dredged areas by re-establishing wetlands whose function and value are at least equal to the existing wetlands.

Under Alternative SD5, a total volume of sediments to be dredged is estimated at 116,000 cy. Further delineation of the impacted areas will be conducted during the design phase. Confirmatory sampling will be conducted to ensure that contaminants are not present in the river bottom. Appropriate measures will be implemented during dredging to control contaminant migration from sediments. Specific details for dredging and sediment erosion control will be developed during the design phase. The design phase will consider the placement of this extra volume of material with respect to stormwater management, erosion control and flood plain elevations. The dredged materials will be dewatered prior to on-site disposal. Water recovered from the dewatering operation will be treated and discharged appropriately in accordance with all applicable requirements.

Groundwater

- Implement a long-term groundwater sampling and analysis program to monitor the contaminant concentrations in the groundwater at the Site, to assess the migration and attenuation of these contaminants in the groundwater over time; and,

- Institutional controls to restrict the installation of wells and the use of contaminated groundwater in the vicinity of the Site.

Under Alternative GW2, monitoring of sediment and surface water quality would also be incorporated into the long-term monitoring plan if it is established during the pre-design investigations that the groundwater is an ongoing source of contamination to sediments and/or surface water. The long-term monitoring program would be performed in accordance with a Long-Term Monitoring Plan, which would be developed using the Final OSWER Monitored Natural Attenuation Policy (USEPA, 1999), following the comprehensive pre-design assessment of the groundwater contamination. The selected groundwater alternative is based on the current data and is subject to change based on future data that may be collected and demonstrates differing conditions.

Technical Impracticability (TI) Waiver

A technical impracticability (TI) waiver evaluation for the attainment of groundwater chemical-specific ARARs/TBCs (GWQS and MCLs) was prepared during the Feasibility Study and is included as Appendix VI. The TI waiver rationale was based on the extremely long time required to achieve groundwater ARARs, the large volume of groundwater to be remediated, the high cost of Alternative GW4, and the extreme difficulty in extracting the inorganics from the aquifer. The TI waiver pertains to the site-wide contaminated groundwater.

Based on historical RI data, current site conditions, the preliminary design of the treatment system, and the contaminant modeling performed as part of the FS, the factors that warranted the decision to declare groundwater restoration as technically impracticable include:

- The thousands of years required to remediate the 1.7 trillion gallons of contaminated groundwater;

- The high present worth cost for groundwater restoration is associated with complete source removal of site-wide soils and slag, which is critical to the success of the groundwater restoration. An additional cost of $649,931,000 for source removal of contaminated soil/slag is inordinately high;

- The significant difficulty in extracting inorganics from the aquifer due to the high level of contaminant sorption and locking into soil;

- The large 200-acre (8.7 million ft^2) spatial area of site-wide contamination;

- The replacement of the treatment system every 30 years of a remediation period lasting thousands of years, based on the typical design life of equipment;

- The inability to achieve groundwater chemical-specific ARARs or target cleanup levels in a reasonable time frame; and

A waiver from achieving NJ-GWQS and federal MCLs is warranted.

Summary of Estimated Remedy Costs

The estimated costs are $24,422,000 for Option (a) and $20,479,000 for Option (b) for Alternative SL3, $11,354,000 for Alternative SD5, and $686,000 for Alternative GW2. A summary of the estimated remedy costs are presented in Table 38 through Table 40. The information in the cost estimate summary tables is based on the best available information regarding the anticipated scope of the remedial alternatives. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternatives. Major changes may be documented in the form of a memorandum in the Administrative Record file, an Explanation of Significant Differences, or a ROD amendment.

The selection of Alternatives SL3, SD5, and GW2 are believed to provide the best balance of trade-offs among the alternatives with respect to the evaluation criteria. EPA and the NJDEP believe that the selected alternatives will be protective of human health and the environment, will comply with ARARs, will be cost effective, and will utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. The selected alternatives will not meet the statutory preference for the selection of a remedy that involves treatment. Institutional controls will be implemented as part of the selected soils and groundwater alternatives to prevent excavations through the cap and restrict future land and groundwater uses.

STATUTORY DETERMINATIONS

CERCLA §121(b)(1), requires that a remedial action must be protective of human health and the environment, cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants, or contaminants at a site. CERCLA §121(d), further specifies that a remedial action must attain a degree of cleanup that satisfies ARARs under federal and state laws, unless a waiver can be justified pursuant to CERCLA §121(d)(4). For the reasons discussed below, EPA has determined that the Selected Remedy meets the requirements of CERCLA §121.

Protection of Human Health and the Environment

SOILS

The Selected Remedy, Alternative SL3, will protect human health and the environment through capping of site-wide contaminated soils and slag, including in the Slag Area. Two distinct capping options based upon the physical characteristics of different portions of the Site, and the current and potential future uses of each portion are protective for the uses specified. Option (a), a soil/asphalt cap, is protective for a mixed recreational and commercial use, and, Option (b), a soil-only cap, is protective for recreational uses. The Selected Remedy will eliminate all significant direct-contact risks to human health and the environment associated with the soil or slag. This action will result in the reduction of exposure levels to acceptable risk levels within EPA's generally acceptable risk range of 10^{-4} to 10^{-6} for carcinogens and below a HI of 1.0 for noncarcinogens. Implementation of the Selected Remedy will not pose unacceptable short-term risks or adverse cross-media impacts.

SEDIMENT

The Selected Remedy, Alternative SD5, will eliminate the risk associated with contaminated material from the sediments through dredging contaminated sediments, dewatering the sediments, on-site disposal, capping of contaminated sediments, and replacement of the dredged sediment with sandy loam. SD5 will prevent exposure to contaminated sediments and restore ecologically-sensitive areas. Implementation of the Selected Remedy will not pose unacceptable short-term risks or adverse cross-media impacts.

GROUNDWATER

The Selected Remedy, Alternative GW2, will be protective of human health and the environment through the implementation of institutional controls in the form of use restrictions and a Classification Exception Area. Implementing institutional controls will prevent future exposure to any contaminated groundwater. Since the existing site groundwater contamination is not migrating towards municipal or private wells, and it is not expected to do so in the future, public exposure to contaminated groundwater is not likely.

Compliance with ARARs

The soil (SL3) and sediment (SD5) remedial actions will comply with all federal and State requirements that are applicable or relevant and appropriate (ARARs) to their implementation. EPA has determined that it is technically impracticable to restore the groundwater to meet chemical-specific ARARs and is invoking a Technical Impracticability Waiver. A comprehensive ARAR discussion is included in Chapter 2 of the Feasibility Study and a complete listing of ARARs is included in Table 36 of this ROD. A copy of the Technical Impracticability Evaluation is included in Appendix VI.

Chemical-Specific ARARs

EPA has determined that it is technically impracticable to restore groundwater to meet the chemical-specific ARARs. The federal and State chemical-specific ARARs include: The Safe Drinking Water Act (40 CFR 141), NJDEP Groundwater Quality Standards (N.J.A.C. 7:9-6), or NJDEP Safe Drinking Water Act Standards (N.J.A.C. 7:10-5.2).

Location-Specific ARARs

RCRA Location Requirements for 100-year Floodplains indicate that hazardous waste treatment, storage, or disposal facilities must be designed, constructed, operated, and maintained to prevent wash-out by a 100-year flood. The Executive Order 11988, Floodplain Management for CERCLA Actions will be met along with NJDEP Flood Hazard Area Regulation (N.J.A.C. 7:13). These standards will be met as CERCLA ARARs for any hazardous waste management activities conducted along the Delaware River or in the slag area (i.e., portions of the Site which are designated as 100-year floodplains). The New Jersey Flood Hazard Area Control Act sets standards on the allowable activities for floodways to protect the environment and human health. These standards will be met for any remediation conducted in a floodway or any activity involving alteration or encroachment upon a waterway. The Executive Order 11990 for Protection of Wetlands, CWA, Section 404(b) 1 Guidelines, as well as the NJDEP Wetlands Act of 1970 Regulations and NJDEP Freshwater Wetlands Protection Act Rules (N.J.A.C. 7:7A), Coastal Resource Development regulations(activities occurring within mapped tidal wetlands or waterfront development zone),and Riparian Lands Management regulations (N.J.S.A. 12:3) will be met for site activities that impact wetlands/tidal wetlands.

Remedial actions involving the management of contaminated sediments will be met including the Rivers and Harbors Act, Section 10 regulations, and NJDEP sediment dredging/excavating regulations.

Location-specific ARARs will be met by conducting remedial actions in accordance with The National Historic Preservation Act (Section 106), and The Archeological Resources Protection Act to take into account the effects of the agency's undertaking on historic properties and management of any archeological resources discovered during remediation activities.

Endangered Species Act (16 U.S.C. 1531) requirements for the protection of federally listed threatened and endangered species and their habitat will be met. The Fish and Wildlife Coordination Act (16 U.S.C. 661) requires consideration of impacts to wildlife resources resulting from modification to waterway(s) and will be met during site remediation activities.

Action-Specific ARARs

Action-specific ARARs will be achieved by conducting remedial action activities in accordance with OSHA, RCRA, and New Jersey hazardous waste regulations. Hazardous wastes will be managed in accordance with RCRA Generator Requirements for Manifesting and Off-Site Waste Transport, Transporter Requirements, DOT Rules for Hazardous Materials Transport, Land Disposal Restrictions, and OSHA standards for Hazardous Responses and General Construction Activities.

Dust control measures and air monitoring will be included in the design specifications and health and safety plans to ensure compliance with RCRA, CAA, and State regulations.

Stormwater discharge or point source discharges will meet CWA effluent guidelines and standards as well as New Jersey water pollution control regulations (e.g. N.J.A.C. 7:14A).

New Jersey soil erosion control and sediment control regulations will be met for site remediation activities involving excavation, grading or other soil disturbance activities exceeding 5,000 square feet.

Advisories, Guidance, and Criteria To Be Considered

The shipment of hazardous wastes off-site to a treatment/disposal facility (if required) would be conducted in accordance with EPA's Office of Solid Waste and Emergency Response Directive No. 9834.11, "Revised Procedures for Planning and Implementing Off-site Response Actions." The intent of this directive is to ensure that facilities authorized to accept CERCLA-generated waste are in compliance with RCRA operating standards.

EPA's 1985 Policy on Wetlands and Floodplains Assessment for CERCLA actions requires that remedial actions meet the substantive requirements the Floodplain Management Executive Order (E.O. 11988), and Appendix A of 40 CFR Part 6, entitled Statement of Procedures on Floodplain Management and Wetland Protection. This policy requires consideration of the 500-year floodplain when planning remedial actions and evaluating their impacts.

The screening and evaluation of sediment quality will be conducted in accordance with EPA guidance (EPA 822-R-93-017), and New Jersey Sediment Quality Evaluation guidance. The EPA's Soil Screening Guidance and State ISRA and Soil Cleanup Criteria will be used for screening and evaluation of soil quality.

Cost-Effectiveness

The Selected Remedy is cost effective and represents reasonable values for the money to be spent. Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence, reduction in toxicity, mobility and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost-effectiveness. The relationship of the overall effectiveness of these remedial alternatives was determined to be proportional to its costs and hence these alternatives represent reasonable values for the money to be spent.

SOILS

The estimated present worth costs range from $54,000 for Alternative SL1 to $649,931,000 for Alternative SL4. In evaluating cost effectiveness between Alternatives SL3, SL4 and SA, Alternative SL3 ($20,479,000 - 24,422,000) is the most cost effective, as it satisfies the remedial action objectives at the least cost, and removes the risks associated with the potential exposure to contaminated soil. Both Alternatives SL4 and SA are inordinately high-costing alternatives that are more protective since the contaminants would be removed from the Site or made unavailable through treatment. Alternative SL1 is the lowest cost but provides no additional protection of human health and the environment. Alternative SL2 is the next lowest cost alternative and provides minimal reduction of risk to human health and no protection of the environment.

SEDIMENTS

The estimated present worth costs range from $54,000 for Alternative SD1 to $19,279,000 for Alternative SD4. In evaluating cost effectiveness between Alternatives SD3 through SD5, Alternative SD5 ($11,354,000) is the most cost effective alternative that satisfies the remedial action objectives by preventing exposure to contaminated sediments and restoring ecologically sensitive areas. Alternative SD3 would be less costly than Alternative SD5, however, effectiveness in the long-term would have to be demonstrated. Alternative SD1 is the lowest cost but provides no additional protection of human health and the environment. Alternative SD2 is the next lowest cost alternative and provides minimal reduction of risk to human health and no protection of the environment.

GROUNDWATER

The estimated present worth costs range from $54,000 for Alternative GW1 to $13,043,000 for Alternative GW4. In evaluating cost effectiveness between Alternatives GW2 and GW4, Alternative GW2 ($686,000) is the most cost effective alternative that satisfies the remedial action objectives by preventing human exposure to contaminated groundwater and monitoring ecological sensitive areas. Alternative GW4 (Option a) would take thousands of years to satisfy the remedial action objectives; thus the increased cost would be unwarranted. Additionally, the cost of complete source removal, which is critical to the success of complete groundwater restoration, is inordinately high ($649,931,000) and not cost effective.

Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

EPA has determined that the Selected Remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in practicable manner at the site. Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA has determined that the Selected Remedy provides the best balance of trade-offs among the alternatives with respect to the five balancing criteria.

SOILS

The Selected Remedy SL3 will effectively minimize human exposure by using soil and asphalt capping, such that long-term performance of the soil and asphalt caps could be maximized by proper maintenance, inspection and monitoring. The Selected Remedy presents less short-term risks than Alternative SL 4, removal, and SA, on-site treatment, by greatly reducing the amount of handling of contaminated soils at the site. There are no special implementability issues associated with the Selected Remedy.

SEDIMENT

Alternatives SD4 and SD5 eliminate the risk associated with contaminated material from the sediments through dredging, disposal and replacement of contaminated sediments with sandy loam soil. The Selected Remedy SD5 requires that sampling of the dredged sediments be performed to assure for safe on-site disposal. Alternative SD3 uses capping of contaminated sediments, which is an effective means of preventing exposure, but would be subject to erosion and therefore may not be as effective over the long-term.

GROUNDWATER

The Selected Remedy for groundwater provides adequate long-term control of risks to human health and the environment through institutional controls. Like the selected soil remedy, there are no special implementability issues associated with the Selected Remedy since the Selected Remedy employs standard technologies that are readily available.

The Selected Remedy for soil, sediment and groundwater do not utilize alternative treatment technologies since basic engineering and construction techniques were deemed very effective and desirable.

Preference for Treatment as a Principal Element

SOILS

The selected soil remedy does not satisfy the statutory preference for treatment as a principal element since the Selected Remedy would cap the contaminated soils and utilize institutional controls to prevent exposure to the contaminated soils. However, the principal threats posed by the site consist mainly of waste products and materials from the steel manufacturing process that have contaminated the soils, sediments and groundwater. The remaining sources of contamination also referred to as areas of concern (AOCs), will be remediated as part of the OU4 building cleanup.

SEDIMENT

The selected sediment remedy does not satisfy the statutory preference for treatment as a principal element since the Selected Remedy requires dredging contaminated sediment, dewatering the sediment, capping the contaminated sediments on-site, and utilizing institutional controls to prevent exposure. However, as with the soils, the principal threats posed by the site consist mainly of waste products and materials from the steel manufacturing process that have contaminated the soils, sediments and groundwater. The sources of contamination also referred to as areas of concern (AOCs) will be remediated as part of the OU4 building cleanup.

GROUNDWATER

The selected groundwater remedy does not satisfy the statutory preference for treatment as a principal element since the Selected Remedy utilizes institutional controls to monitor the levels of contamination in groundwater and any potential migration. ARARs are not expected to be achieved due to the extremely long time required to achieve groundwater ARARs, the large volume of groundwater to be remediated, the high cost of Alternative GW4, and the extreme difficulty in extracting the inorganics from the aquifer; therefore, EPA is invoking a technical impracticability waiver.

Five-Year Review Requirements

Because the Selected Remedy will result in hazardous substances, pollutants, or contaminants remaining on the site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of the remedial actions to ensure that the Selected Remedy is, or will be, protective of human health and the environment.

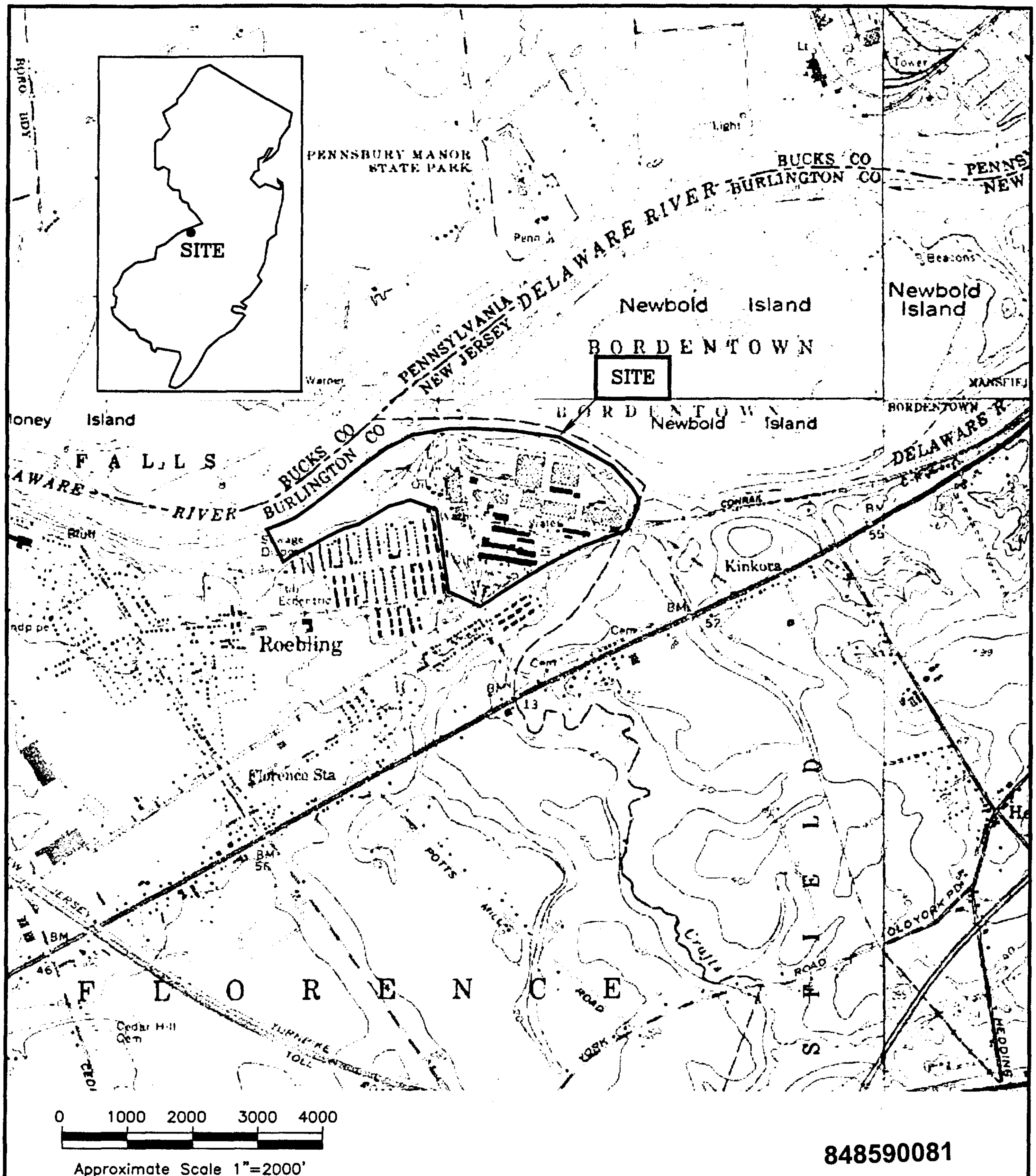
DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for the Roebling Steel Company Site was released for public comment on August 21, 2003. The comment period closed on September 19, 2003.

All written and verbal comments submitted during the public comment period were reviewed by EPA. Upon review of these comments, it was determined that no significant changes to the remedy, as it was originally identified in the Proposed Plan, were necessary.

APPENDIX I

FIGURES



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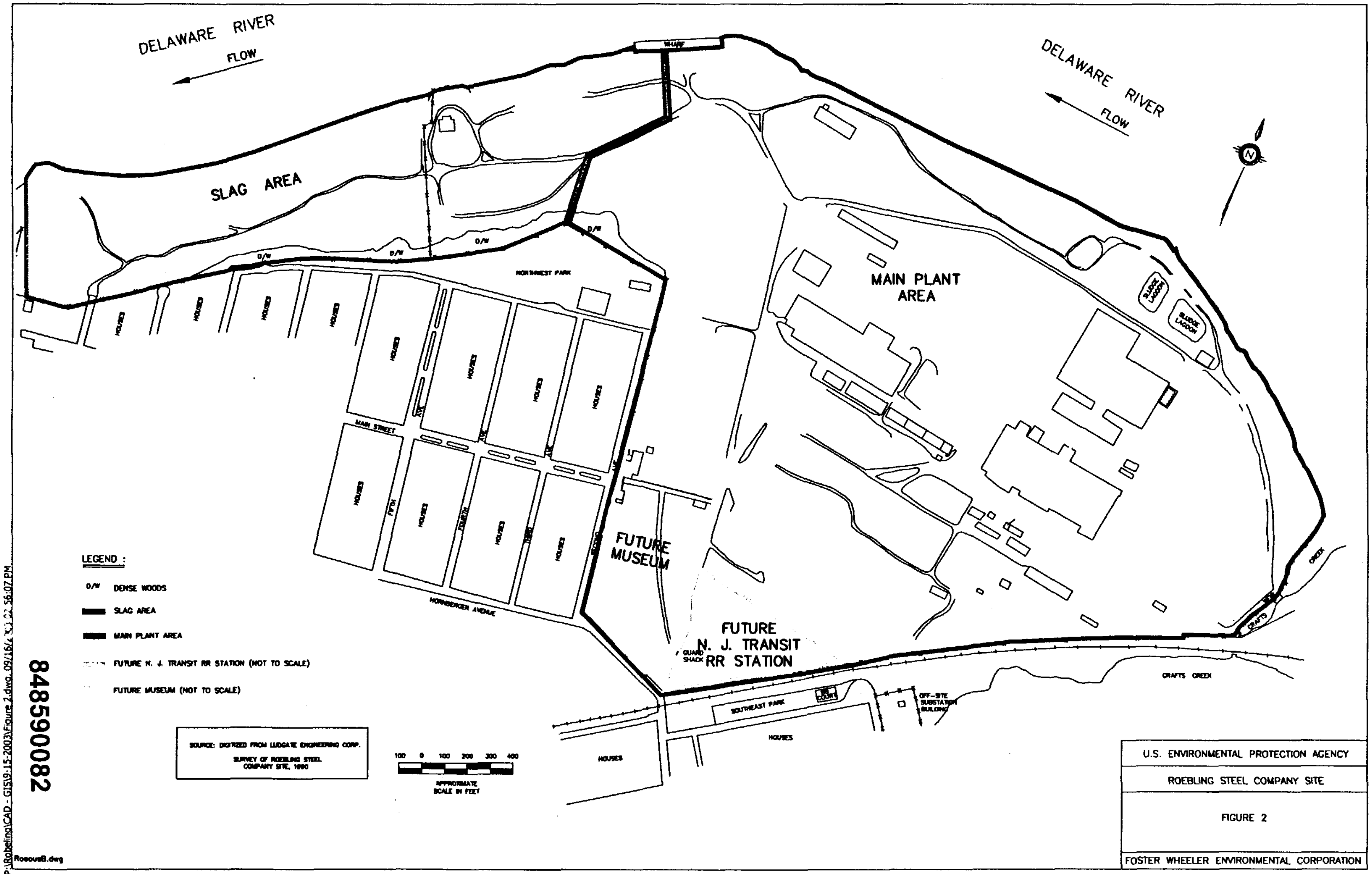
SOURCE:

USGS TOPOGRAPHIC 7½ MINUTE SERIES QUADRANGLES
TRENTON WEST, NJ. BRISTOL, PA. TRENTON EAST, NJ.

U.S. ENVIRONMENTAL PROTECTION AGENCY
Roebling Steel Company Site

FIGURE 1
SITE LOCATION MAP

FOSTER WHEELER ENVIRONMENTAL CORPORATION



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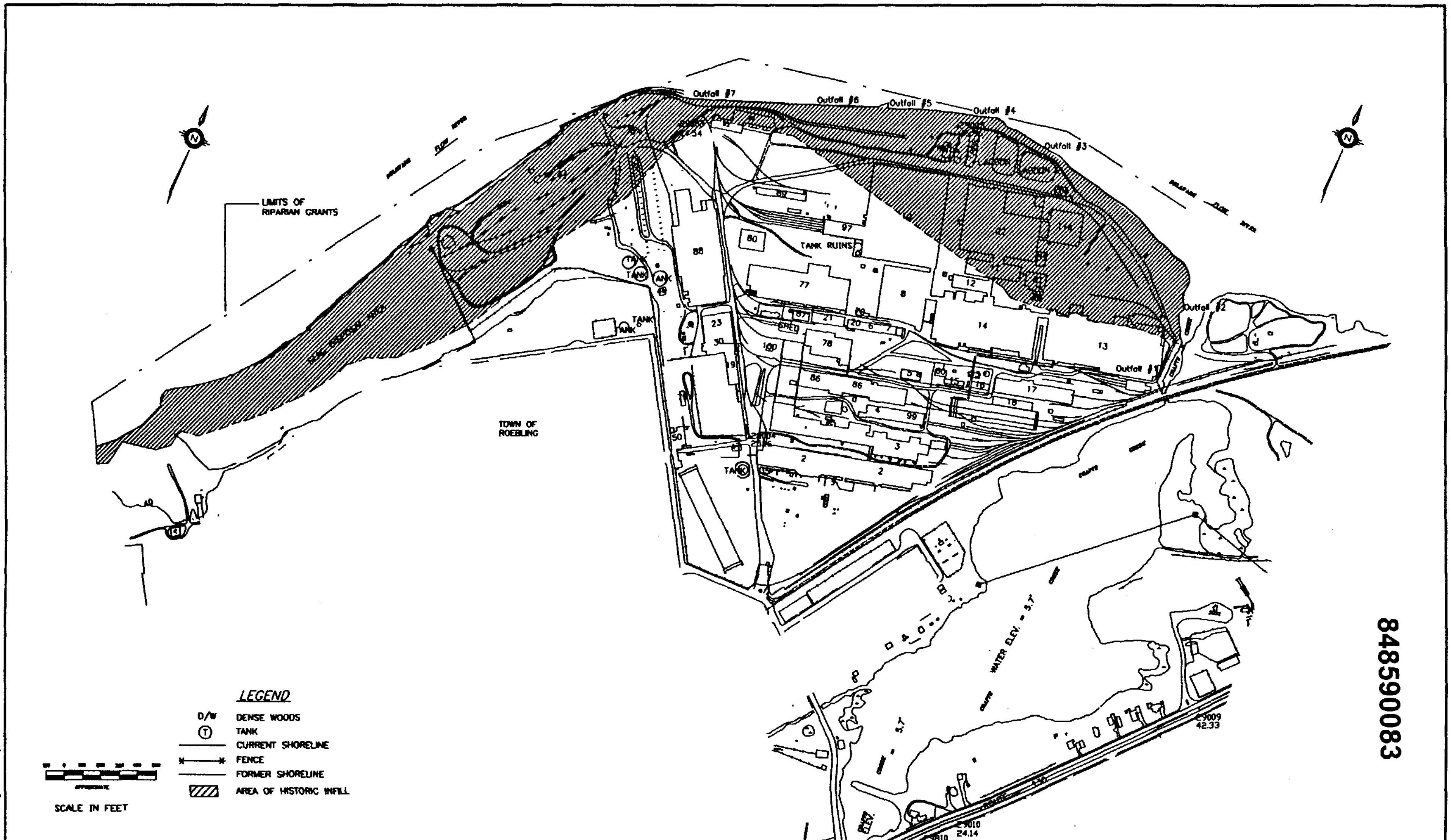

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Figure3

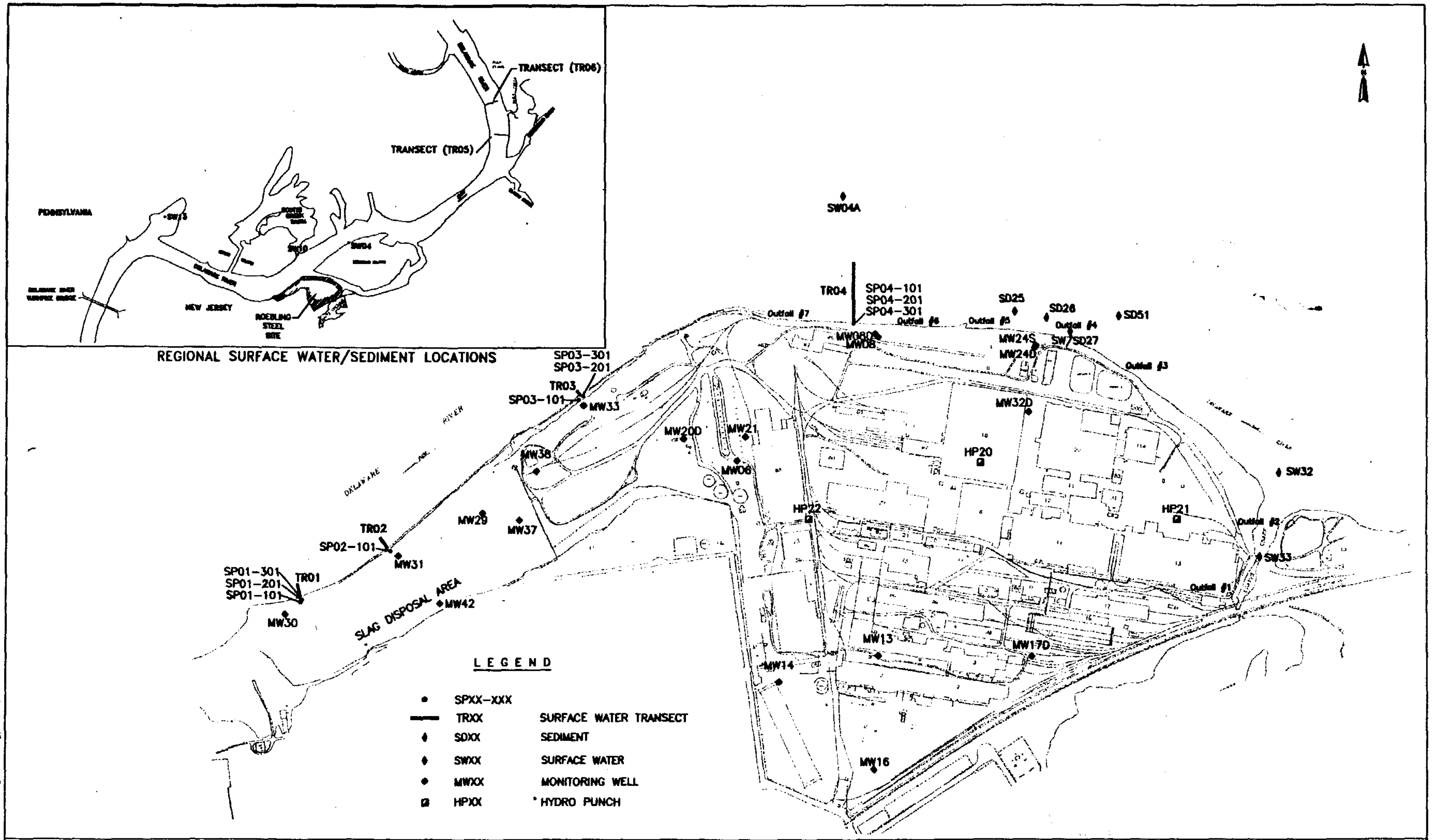
U.S. ENVIRONMENTAL PROTECTION AGENCY

Roebling Steel Company Site

Figure 3

Site Map

FOSTER WHEELER ENVIRONMENTAL CORPORATION



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U.S. ENVIRONMENTAL PROTECTION AGENCY
Roebling Steel Company Site

FIGURE 4

FOSTER WHEELER ENVIRONMENTAL CORPORATION

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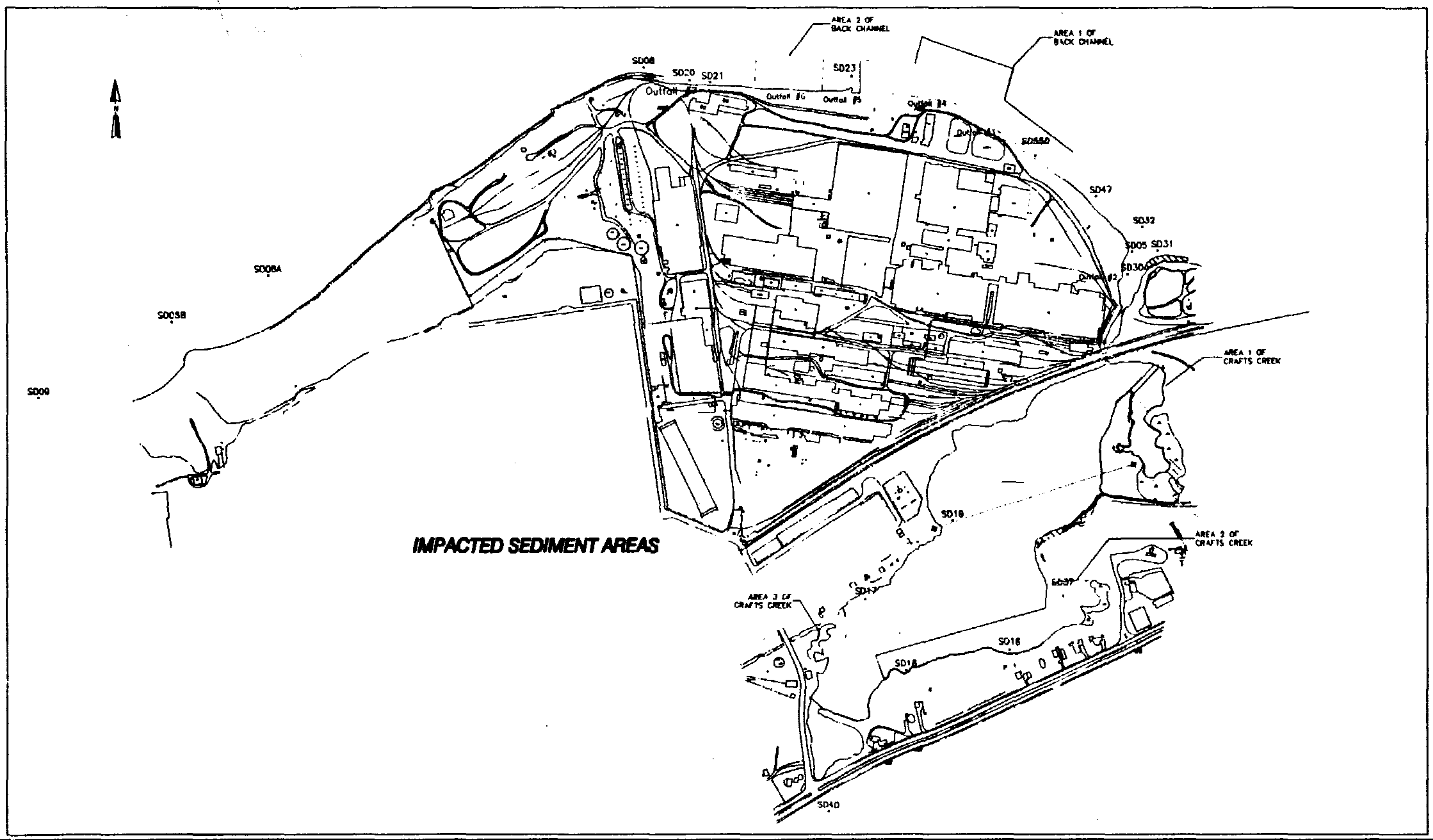

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U.S. ENVIRONMENTAL PROTECTION AGENCY
Roebling Steel Company Site

Figure 5
Sediment Areas of Concern

FOSTER WHEELER ENVIRONMENTAL CORPORATION

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APPENDIX II

TABLES

TABLE 1
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
ARARs/TBCs FOR SOILS

CONSTITUENT	EPA SOIL SCREENING LEVEL - MIGRATION TO GROUNDWATER DAF = 20	EPA SOIL SCREENING LEVEL - INGESTION	EPA SOIL SCREENING LEVEL - INHALATION	NJDEP SOIL CLEANUP CRITERIA IMPACT TO GROUNDWATER	NJDEP SOIL CLEANUP CRITERIA DIRECT CONTACT NON-RESIDENTIAL	NJDEP SOIL CLEANUP CRITERIA DIRECT CONTACT RESIDENTIAL	MOST STRINGENT CRITERIA
Volatile Organic Compounds (ug/kg)							
1,1,1,2-Tetrachloroethane	-	-	-	1,000	310,000	170,000	1,000
1,1,1-Trichloroethane	2,000	-	120,000	50,000	1,000,000	210,000	2,000
1,1,2,2-Tetrachloroethane	3	3,000	60	1,000	70,000	34,000	3
1,1,2-Trichloroethane	20	11,000	100	1,000	420,000	22,000	20
1,1-Dichloroethane	23,000	7,800,000	130,000	10,000	1,000,000	570,000	10,000
1,1-Dichloroethene	60	1,000	7	10,000	150,000	8,000	7
1,2-Dichloroethane	20	7,000	40	1,000	24,000	6,000	20
1,2-Dichloroethene	-	-	-	50,000	1,000,000		50,000
1,2-Dichloropropane	30	9,000	1,500	-	43,000	10,000	30
1,3-Dichloropropene	4	4,000	10	-	-	-	4
2-Butanone (MEK)	-	-	-	50,000	1,000,000	1,000,000	50,000
Acetone	16,000	7,800,000	10,000,000	100,000	1,000,000	1,000,000	16,000
Benzene	30	22,000	80	1,000	13,000	3,000	30
Bromodichloromethane	600	10,000	300,000	1,000	46,000	11,000	600
Bromoform	800	81,000	5,300	1,000	370,000	86,000	800
Bromomethane	-	-	-	1,000	1,000,000	79,000	1,000
Carbon disulfide	32,000	7,800,000	72,000	-	-	-	32,000
Carbon tetrachloride	70	5,000	30	1,000	4,000	2,000	30
Chlorobenzene	1,000	1,600,000	13,000	1,000	680,000	37,000	1,000
Chloroform	600	100,000	30	1,000	28,000	19,000	30
Chloromethane	-	-	-	10,000	1,000,000	520,000	10,000
cis-1,2-Dichloroethylene	400	780,000	120,000	1,000	1,000,000	79,000	400
Dibromochloromethane	400	8,000	130,000	1,000	1,000,000	110,000	400
Ethene, 1,2-dichloro-, (E)-	700	1,600,000	310,000	-	-	1,000,000	700
Ethylbenzene	13,000	7,800,000	40,000	100,000	1,000,000	1,000,000	13,000
Methyl bromide	200	110,000	1,000	-	-	-	200
Methyl isobutyl ketone (MIBK)	-	-	-	50,000	1,000,000	1,000,000	50,000
Methylene chloride	20	85,000	1,300	1,000	210,000	49,000	20
m-Xylene	210,000	160,000,000	42,000	-	-	-	42,000
o-Xylene	190,000	160,000,000	41,000	-	-	-	41,000
p-Xylene	200,000	160,000,000	46,000	-	-	-	46,000
Styrene	4,000	16,000,000	150,000	100,000	97,000	23,000	4,000
Tetrachloroethene	60	12,000	1,100	1,000	6,000	4,000	60
Toluene	12,000	16,000,000	65,000	500,000	1,000,000	1,000,000	12,000
Trichloroethylene	60	58,000	500	1,000	54,000	23,000	60
Vinyl chloride	10	300	3	10,000	7,000	2,000	3
Xylene (total)	-	-	-	67,000	1,000,000	410,000	67,000

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TABLE 1
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
ARARs/TBCs FOR SOILS
(Page 2 of 4)

CONSTITUENT	EPA SOIL SCREENING LEVEL MIGRATION TO GROUNDWATER DAF = 20	EPA SOIL SCREENING LEVEL INGESTION	EPA SOIL SCREENING LEVEL INHALATION	NJDEP SOIL CLEANUP CRITERIA IMPACT TO GROUNDWATER	NJDEP SOIL CLEANUP CRITERIA DIRECT CONTACT NON-RESIDENTIAL	NJDEP SOIL CLEANUP CRITERIA DIRECT CONTACT RESIDENTIAL	MOST STRINGENT CRITERIA
Semi-Volatile Organic Compounds (ug/kg)							
1,2,4-Trichlorobenzene	5,000	780,000	320,000	100,000	1,200,000	68,000	5,000
1,2-Dichlorobenzene	17,000	7,000,000	56,000	50,000	10,000,000	5,100,000	17,000
1,3-Dichlorobenzene	-	-	-	100,000	10,000,000	5,100,000	100,000
1,4-Dichlorobenzene	2,000	27,000	-	100,000	10,000,000	570,000	2,000
2,4,5-Trichlorophenol	270,000	7,800,000	-	50,000	10,000,000	5,600,000	50,000
2,4,6-Trichlorophenol	200	58,000	20,000	10,000	270,000	62,000	200
2,4-Dichlorophenol	1,000	230,000	-	10,000	3,100,000	170,000	1,000
2,4-Dimethylphenol	9,000	1,600,000	-	10,000	10,000,000	1,100,000	9,000
2,4-Dinitrophenol	300	160,000	-	10,000	2,100,000	110,000	300
2,4-Dinitrotoluene	0.8	900	-	10,000	4,000	1,000	0.8
2,6-Dinitrotoluene	0.7	900	-	10,000	4,000	1,000	0.7
2-Chlorophenol	4,000	390,000	5,300,000	10,000	5,200,000	280,000	4,000
2-Methylphenol	15,000	3,900,000	-	-	10,000,000	2,800,000	15,000
3,3'-Dichlorobenzidine	7	1,000	-	100,000	6,000	2,000	7
4-Chloro-3-methylphenol	-	-	-	100,000	10,000,000	10,000,000	100,000
4-Chloroaniline	-	-	-	-	4,200,000	230,000	230,000
4-Methylphenol	-	-	-	-	10,000,000	2,800,000	2,800,000
Acenaphthene	570,000	4,700,000	-	100,000	10,000,000	3,400,000	100,000
Acrylonitrile	-	-	-	1,000	5,000	1,000	1,000
Anthracene	12,000,000	23,000,000	-	100,000	10,000,000	10,000,000	100,000
Benzo(a)pyrene	8,000	90	-	10,000	660	660	90
Benzo[a]anthracene	2,000	900	-	500,000	4,000	900	900
Benzo[b]fluoranthene	5,000	900	-	50,000	4,000	900	900
Benzo[k]fluoranthene	49,000	9,000	-	500,000	4,000	900	900
Benzoic acid	400,000	310,000,000	-	-	-	-	400,000
Benzyl alcohol				50,000	10,000,000	10,000,000	50,000
Bis(2-chloroethyl)ether	0.4	600	20	10,000	3,000	660	0.4
Bis(2-chloroisopropyl)ether	-	-	-	10,000	10,000,000	2,300,000	10,000
Bis(2-ethylhexyl)phthalate	3,600,000	46,000	3,100,000	100,000	210,000	49,000	46,000
Butyl benzyl phthalate	930,000	16,000,000	93,000	100,000	10,000,000	1,100,000	93,000
Carbazole	600	32,000	-	-	-	-	600
Chrysene	160,000	88,000	-	500,000	40,000	9,000	9,000
cis-1,3-Dichloropropene	-	-	-	1,000	5,000	4,000	1,000
Dibenzo(a,h)anthracene	2,000	90	-	100,000	660	660	90
Diethyl phthalate	470,000	63,000,000	200,000	50,000	10,000,000	10,000,000	50,000
Dimethyl phthalate	-	-	-	50,000	10,000,000	10,000,000	50,000
Di-n-butyl phthalate	2,300,000	7,800,000	230,000	100,000	10,000,000	5,700,000	100,000
Di-n-octyl phthalate	10,000,000	1,600,000	1,000,000	100,000	10,000,000	1,100,000	100,000
Fluoranthene	4,300,000	3,100,000	-	100,000	10,000,000	2,300,000	100,000
Fluorene	560,000	3,100,000	-	100,000	10,000,000	2,300,000	100,000
Hexachlorobenzene	2,000	400	100	100,000	2,000	660	100
Hexachlorobutadiene	2,000	8,000	800	100,000	21,000	1,000	800
Hexachlorocyclopentadiene	400,000	550,000	1,000	100,000	7,300,000	400,000	1,000

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TABLE 1
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
ARARs/TBCs FOR SOILS

CONSTITUENT	EPA SOIL SCREENING LEVEL: MIGRATION TO GROUNDWATER DAF = 20	EPA SOIL SCREENING LEVEL INGESTION	EPA SOIL SCREENING LEVEL INHALATION	NJDEP SOIL CLEANUP CRITERIA IMPACT TO GROUNDWATER	NJDEP SOIL CLEANUP CRITERIA DIRECT CONTACT NON-RESIDENTIAL	NJDEP SOIL CLEANUP CRITERIA DIRECT CONTACT RESIDENTIAL	MOST STRINGENT CRITERIA
Hexachloroethane	500	46,000	5,500	100,000	100,000	6,000	500
Indeno[1,2,3-cd]pyrene	14,000	900	-	500,000	4,000	900	900
Isophorone	500	670,000	460,000	50,000	10,000,000	1,100,000	500
Naphthalene	84,000	3,100,000	-	100,000	4,200,000	230,000	84,000
n-Butyl alcohol	17,000	7,800,000	1,000,000	-	-	-	17,000
Nitrobenzene	100	39,000	9,200	10,000	520,000	28,000	100
N-Nitrosodi-n-propylamine	0.05	90	-	10,000	660	660	0.05
N-Nitrosodiphenylamine	1,000	130,000	-	100,000	600,000	140,000	1,000
p-Chloroaniline	700	310,000	-	-	-	-	700
Pentachlorophenol	30	3,000	-	100,000	24,000	6,000	30
Phenol	100,000	47,000,000	-	50,000	10,000,000	10,000,000	50,000
Pyrene	4,200,000	2,300,000	-	100,000	10,000,000	1,700,000	100,000
trans-1,3-Dichloropropene	-	-	-	1,000	5,000	4,000	1,000
Vinyl Acetate	170,000	78,000,000	100,000	-	-	-	100,000
Pesticide/PCBs (ug/kg)							
4,4'-DDD	16,000	3,000	-	50,000	12,000	3,000	3,000
4,4'-DDE	54,000	2,000	-	50,000	9,000	2,000	2,000
4,4'-DDT	32,000	2,000	-	500,000	9,000	2,000	2,000
ALDRIN	500	40	300	50,000	170	40	40
alpha-BHC	0.5	100	80	-	-	-	0.5
Aroclor 1016	-	-	-	50,000	2,000	490	490
Aroclor 1221	-	-	-	50,000	2,000	490	490
Aroclor 1232	-	-	-	50,000	2,000	490	490
Aroclor 1242	-	-	-	50,000	2,000	490	490
Aroclor 1248	-	-	-	50,000	2,000	490	490
Aroclor 1254	-	-	-	50,000	2,000	490	490
Aroclor 1260	-	-	-	50,000	2,000	490	490
beta-BHC	3	400	-	-	-	-	3
Chlordane	10,000	500	2,000	-	-	-	500
DIELDRIN	4	40	100	50,000	180	42	4
Endosulfan (mixed isomers)	18,000	470,000	-	-	-	-	18,000
Endosulfan I	-	-	-	50,000	6,200,000	340,000	50,000
Endosulfan II	-	-	-	50,000	6,200,000	340,000	50,000
ENDRIN	1,000	23,000	-	50,000	310,000	17,000	1,000
HEPTACHLOR	23,000	100	400	50,000	650	150	100
Heptachlor epoxide	700	70	500	-	-	-	70
Lindane	9	500	-	50,000	2,200	520	9
Methoxychlor	160,000	390,000	-	50,000	5,200,000	280,000	50,000
PCB's	-	1,000	-	-	v	v	1,000
Toxaphene	31,000	600	8,900	50,000	200	100	100

TABLE 1
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
ARARs/TBCs FOR SOILS

CONSTITUENT	EPA SOIL SCREENING LEVEL - MIGRATION TO GROUNDWATER DAF = 20	EPA SOIL SCREENING LEVEL INGESTION	EPA SOIL SCREENING LEVEL INHALATION	NJDEP SOIL CLEANUP CRITERIA IMPACT TO GROUNDWATER	NJDEP SOIL CLEANUP CRITERIA DIRECT CONTACT NON-RESIDENTIAL	NJDEP SOIL CLEANUP CRITERIA DIRECT CONTACT RESIDENTIAL	MOST STRINGENT CRITERIA
Inorganics (mg/kg)							-
Antimony	5	31	-	-	340	14	5
Arsenic	29	0.4	750	-	20	20	20(1)
Barium	1,600	5,500	690,000	-	47,000	700	700
Beryllium	63	0.1	1,300	-	2	2	0.1
Cadmium	8	78	1,800	-	100	1	1
Chromium	38	390	270	-	-	-	38
Chromium (Hexavalent)	38	390	270	-	6,100	240	38
Chromium (III)	-	78,000	-	-	-	120,000	78,000
Copper	-	-	-	-	600	600	600
Cyanide	40	1,600	-	-	21,000	1,100	40
Lead	-	400	-	-	600	400	400
Mercury	2	23	1	-	270	14	1
Nickel	130	1,600	13,000	-	2,400	250	130
Selenium	5	390	-	-	3,100	63	5
Silver	34	390	-	-	4,100	110	34
Thallium	0.7	-	-	-	6	2	0.7
Vanadium	6,000	550	-	-	7,100	370	370
Zinc	12,000	23,000	-	-	1,500	1,500	1,500

Note:
(1) The selected value for most stringent criterion for arsenic is the NJDEP Soil Cleanup Criterion for Direct Contact. The EPA SSL for ingestion value of 0.4 mg/kg is more stringent; however, use of this criterion would not provide for meaningful discussion since all detected concentrations exceed this value.

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TABLE 2
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE
SUMMARY OF ANALYTICAL RESULTS FOR ORGANIC COMPOUNDS IN SURFACE SOIL SAMPLES (0-0.2 feet)

COMPOUND	FREQUENCY OF DETECTION	MINIMUM DETECTED CONCENTRATION (ug/kg)	MAXIMUM DETECTED CONCENTRATION (ug/kg)	AVERAGE DETECTED CONCENTRATION * (ug/kg)
1,1,1 Trichloroethane	2/46	3	6	5
Acetone	5/44	10	40	21
Benzene	2/46	2	2	2
Chloroform	7/46	1	4	2
Ethylbenzene	2/44	2	75	39
Tetrachloroethylene	2/45	4	9	7
Toluene	15/45	2	150	24
Xylene	4/45	2	330	86
2-Methylnaphthalene	35/61	32	300000	9270
2-Methylphenol	1/61	170	170	170
4-chlorophenyl-phenylether	1/61	4500	4500	4500
4-Methylphenol	4/61	24	200	86
1,4-Dichlorobenzene	2/61	21	38	30
2,4-Dimethylphenol	1/61	31	31	31
2,4-Dinitrotoluene	1/61	15000	15000	15000
3,3'-Dichlorobenzidine	1/59	850	850	850
Acenaphthene	11/61	37	35000	3571
Acenaphthylene	20/61	25	3000	381
Anthracene	27/61	40	12000	954
Benzo[a]anthracene	44/61	35	20000	1614
Benzo[b]fluoranthene	49/61	29	16000	1624
Benzo(g,h,i)perylene	38/60	36	10000	724
Benzo[k]fluoranthene	21/35	20	15000	1893
Benzo(a)pyrene	43/61	19	17000	1349
Benzoic acid	11/42	41	720	176
bis(2-Ethylhexyl) phthalate	27/61	110	170000	7878
Butyl benzyl phthalate	20/60	24	180000	9627
Carbazole	9/13	20	1700	352
Chrysene	54/61	32	18000	1594
Di-n-butylphthalate	16/61	31	140000	8856
Di-n-octylphthalate	1/60	31	31	31
Dibenz[a,h]anthracene	19/60	23	5300	643
Dibenzofuran	16/61	21	36000	2393
Diethylphthalate	1/61	180	180	180
Dimethylphthalate	1/61	210	210	210
Fluoranthene	56/61	27	38000	2294
Fluorene	14/61	28	60000	4495
Hexachlorobenzene	2/61	250	610	430
Indeno[1,2,3-cd]pyrene	39/61	45	9700	706
N-Nitrosodiphenylamine (1)	4/61	50	32000	8076
Naphthalene	36/61	23	26000	1034
Pentachlorophenol	1/61	12000	12000	12000
Phenanthrene	52/61	39	140000	3837
Phenol	1/61	130	130	130
Pyrene	53/61	26	57000	2854
4,4'-DDE	4/57	5	110	38
4,4'-DDT	3/57	17	59	31
alpha-Chlordane	1/57	8	8	8
beta-BHC	2/56	19	33	26
Endosulfan II	1/57	11	11	11
Endrin aldehyde	1/3	9	9	9
Endrin ketone	3/57	4	18	11
gamma-Chlordane	2/57	3	6	5
Aroclor-1242	1/57	1900	1900	1900
Aroclor-1248	1/57	5200	5200	5200
Aroclor-1254	3/57	420	790	610
Aroclor-1260	3/57	420	1100	830
Total PCBs	8/57	420	5200	1428

*Arithmetic average of concentrations above detection limits only.

TABLE 3
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE
SUMMARY OF ANALYTICAL RESULTS FOR INORGANICS IN SURFACE SOIL SAMPLES (0-0.2 feet)

ANALYTE	FREQUENCY OF DETECTION	MAXIMUM DETECTED CONCENTRATION (mg/kg)	AVERAGE DETECTED CONCENTRATION * (mg/kg)
Aluminum	62/62	18300	3866
Antimony	32/62	178	21
Arsenic	47/47	62	16
Barium	62/62	1540	144
Beryllium	32/59	4	1
Cadmium	45/59	390	28
Calcium	62/62	343000	30894
Chromium	62/62	1440	158
Cobalt	59/61	60	12
Copper	57/57	9960	842
Iron	62/62	312000	79261
Lead	60/61	69000	7161
Magnesium	62/62	107000	10844
Manganese	56/56	20300	3216
Mercury	28/56	2	0.3
Nickel	61/61	563	87
Potassium	61/62	3020	542
Selenium	17/37	3	1
Silver	15/61	36	7
Sodium	27/60	1690	308
Thallium	4/61	1	1
Vanadium	62/62	128	38
Zinc	61/62	118000	5275

* Arithmetic average of concentrations above detection limits only.

TABLE 4
UNITED STATES ENVIRONMENAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE
SUMMARY OF ANALYTICAL RESULTS FOR ORGANIC COMPOUNDS IN SURFACE SOIL SAMPLES (0.2-2 feet)

COMPOUND	FREQUENCY DETECTION	MINIMUM DETECTED CONCENTRATION(ug/kg)	MAXIMUM DETECTED CONCENTRATION(ug/kg)	AVERAGE DETECTED CONCENTRATION(ug/kg) *
1,1-Dichloroethane	1/53	3	3	3
1,2-Dichloropropane	1/52	4	4	4
1,1,1-Trichloroethane	9/53	1	61	12
Acetone	6/52	17	230	68
Benzene	3/53	2	5	3
Bromodichloromethane	3/52	3	6	4
Carbon disulfide	5/53	2	19	7
Carbon tetrachloride	4/52	2	3	3
Chlorobenzene	7/48	32	72	49
Chloroform	11/53	1	13	5
Ethylbenzene	7/46	2	110	19
Ethylene trichloride	2/52	1	8	5
Methyl ethyl ketone (MEK)	2/42	9	30	20
Tetrachloroethylene	9/49	2	10	5
Toluene	39/53	1	490	53
Xylene (total)	14/48	1	750	65
2-Methylnaphthalene	30/58	40	39000	1642
4-Methylphenol	1/58	2900	2900	2900
1,4-Dichlorobenzene	1/58	22	22	22
Acenaphthene	12/58	26	7600	927
Acenaphthylene	9/58	34	490	144
Anthracene	20/58	24	4200	685
Benzo[a]anthracene	31/58	24	7300	1317
Benzo[b]fluoranthene	34/58	35	7500	1301
Benzo(g,h,i)perylene	24/57	20	6400	881
Benzo[k]fluoranthene	20/54	22	7700	1545
Benzo(a)pyrene	29/58	24	5400	1060
Benzoic acid	10/52	49	2500	423
bis(2-Ethylhexyl) phthalate	9/57	27	30000	5547
Butyl benzyl phthalate	5/57	39	9100	2539
Carbazole	5/6	17	260	83
Chrysene	38/58	48	7100	1254
Di-n-butylphthalate	6/58	31	12000	2162
Di-n-octylphthalate	1/57	58	58	58
Dibenz[a,h]anthracene	17/58	18	1600	339
Dibenzofuran	15/58	24	6700	735
Diethylphthalate	3/58	120	260	197
Fluoranthene	38/58	33	15000	1863
Fluorene	11/58	20	9000	1184
Indeno[1,2,3-cd]pyrene	23/58	24	5800	879
Naphthalene	23/57	36	4500	602
Phenanthrene	39/58	21	26000	2058
Phenol	1/58	2500	2500	2500
Pyrene	39/58	26	12000	1680
4,4'-DDE	2/56	19	130	75
4,4'-DDT	1/56	11	11	11
Aldrin	4/56	10	81	43
alpha-Chlordane	1/57	4	4	4
beta-BHC	4/56	29	94	58
Dieldrin	1/57	15	15	15
Endosulfan sulfate	1/56	6	6	6
Endrin ketone	2/56	6	18	12
gamma-Chlordane	1/55	2	2	2
Heptachlor epoxide	1/56	13	13	13
Methoxychlor	1/56	940	940	940
Aroclor-1242	8/56	110	3800	1181
Aroclor-1260	1/56	300	300	300
Total PCBs	9/56	100	3800	1083

* Arithmetic average of concentrations above detection limits only.

TABLE 5
UNITED STATES ENVIRONMENAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE
SUMMARY OF ANALYTICAL RESULTS FOR INORGANICS IN SURFACE SOIL SAMPLES (0.2-2 feet)

ANALYTE	FREQUENCY OF DETECTION	MAXIMUM DETECTED CONCENTRATION(mg/kg)	AVERAGE DETECTED CONCENTRATION(mg/kg) *
Aluminum	59/59	16100	3000
Antimony	24/59	65	14
Arsenic	54/54	85	18
Barium	59/59	480	77
Beryllium	34/57	1	0.4
Cadmium	23/53	287	23
Calcium	58/59	206000	21914
Chromium	58/58	1950	134
Cobalt	56/59	41	10
Copper	55/55	3590	522
Iron	59/59	283000	53685
Lead	54/54	66500	4747
Magnesium	59/59	106000	10005
Manganese	53/53	26200	3148
Mercury	21/54	1	0.3
Nickel	54/57	322	45
Potassium	55/59	1700	471
Selenium	11/37	2	1
Silver	9/55	16	5
Sodium	33/58	964	180
Thallium	12/53	1	0.5
Vanadium	59/59	246	41
Zinc	56/57	154000	3359

* Arithmetic average of concentrations above detection limits only.

TABLE 6
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE
SUMMARY OF ANALYTICAL RESULTS FOR ORGANIC COMPOUNDS IN SUBSURFACE SOIL SAMPLES

COMPOUND	FREQUENCY OF DETECTION	MINIMUM DETECTED CONCENTRATION(ug/kg)	MAXIMUM DETECTED CONCENTRATION(ug/kg)	AVERAGE DETECTED CONCENTRATION(ug/kg) *
2-Hexanone	1/117	1	1	1
1,1,1-Trichloroethane	10/128	1	14	5
1,1,2,2-Tetrachloroethane	1/117	5	5	5
Acetone	16/103	6	19000	2384
Benzene	8/123	2	5	4
Bromodichloromethane	2/127	3	6	5
Carbon disulfide	9/128	1	16	5
Carbon tetrachloride	5/127	2	4	3
Chlorobenzene	11/122	1	69	45
Chloroethane	1/128	4	4	4
Chloroform	12/128	1	62	9
Ethylbenzene	1/117	1	1	1
Ethylene trichloride	3/127	2	34	17
Methylene chloride	17/36	5	230	25
Methyl ethyl ketone (MEK)	19/109	2	67	15
Methyl isobutyl ketone (MIBK)	1/117	17	17	17
Tetrachloroethylene	12/121	1	12	5
Toluene	65/126	0	300	23
Vinyl Acetate	1/73	14	14	14
Vinyl chloride	1/128	16	16	16
Xylene (total)	8/118	1	23	7
2-Methylnaphthalene	23/123	51	19000	981
4-Chloro-3-methylphenol	1/123	150	150	150
4-Methylphenol	2/123	65	240	153
Acenaphthene	8/123	54	560	217
Acenaphthylene	5/123	34	81	62
Anthracene	24/124	27	1400	267
Benzo[a]anthracene	33/124	52	3600	733
Benzo[b]fluoranthene	35/121	75	4800	822
Benzo(g,h,i)perylene	19/121	45	1700	508
Benzo[k]fluoranthene	19/115	87	2100	702
Benzo(a)pyrene	37/124	41	2600	584
Benzoic acid	12/123	130	6000	917
bis(2-Ethylhexyl) phthalate	27/116	33	9300	676
Butyl benzyl phthalate	1/123	880	880	880
Chrysene	40/124	42	3500	761
Di-n-butylphthalate	17/111	23	1600	399
Di-n-octylphthalate	4/123	53	1200	346
Dibenz[a,h]anthracene	8/124	92	610	274
Dibenzofuran	14/123	48	420	145
Diethylphthalate	4/123	36	510	204
Fluoranthene	40/124	31	6100	1143
Fluorene	12/123	45	620	182
Indeno[1,2,3-cd]pyrene	21/124	51	1600	524
Isophorone	1/123	36	36	36
N-Nitrosodiphenylamine (1)	1/123	80	80	80
Naphthalene	19/123	43	2100	271
Phenanthrene	41/125	43	5200	868
Phenol	2/123	59	330	195
Pyrene	45/125	29	5900	933
Aldrin	2/128	10	50	30
beta-BHC	3/127	88	190	123
Endosulfan I	2/128	7	17	12
Endrin ketone	2/128	22	51	37
gamma-Chlordane	1/136	14	14	14
Heptachlor epoxide	3/128	6	31	15
Methoxychlor	1/128	190	190	190
Aroclor-1242	6/128	110	3100	885
Aroclor-1260	1/127	190	190	190
Total PCBs	7/128	110	3100	786

* Arithmetic average of concentrations above detection limits only.

TABLE 7
UNITED STATES ENVIRONMENAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE
SUMMARY OF ANALYTICAL RESULTS FOR INORGANICS IN SUBSURFACE SOIL SAMPLES
(>2 feet)

ANALYTE	FREQUENCY OF DETECTION	MAXIMUM DETECTED CONCENTRATION (mg/kg)	AVERAGE DETECTED CONCENTRATION * (mg/kg)
Aluminum	103/120	12900	3085
Antimony	32/101	36	10
Arsenic	94/118	80	16
Barium	94/122	742	63
Beryllium	45/116	5	1
Cadmium	15/114	20	5
Calcium	96/122	113000	9794
Chromium	98/115	536	44
Cobalt	79/120	30	7
Copper	96/106	8080	279
Cyanide	1/28	2	2
Iron	104/120	182000	29828
Lead	98/112	90600	1838
Magnesium	91/122	49800	2820
Manganese	102/114	26500	1754
Mercury	19/116	15	1
Nickel	71/118	228	23
Potassium	84/122	3000	564
Selenium	15/91	4	1
Silver	6/96	67	13
Sodium	52/120	2780	187
Thallium	10/114	0.7	0.4
Vanadium	95/122	594	48
Zinc	93/96	13100	444

* Arithmetic average of concentrations above detection limits only.

TABLE 8
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
ARARs/TBCs FOR GROUNDWATER, SEDIMENT, AND SURFACE WATER
(Sheet 1 of 2)

Material	Groundwater			Sediment					Surface Water			
	New Jersey GWQS	Federal MCLs	Most Stringent	Canadian LEL	Canadian SEL	ER-L	ER-M	Most Stringent	Minimum SWAQD	Minimum SWAQT	Minimum SWHHT	Most Stringent
Volatile Organics												
Acetone	700	-	700	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	300	-	300	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	6	80	6	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	70	-	70	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	30	200	30	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	2	5	2	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene	-	70	70	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	3	5	3	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	1	-	1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	1,000	1,000	1,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	1	5	1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	2	5	2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylene (Total)	1,000	10,000	1,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semi-Volatile Organics												
Di-n-butylphthalate	900	-	900	-	-	-	-	-	NA	NA	NA	NA
bis(2-Ethylhexyl) phthalate	30	6	6	-	-	-	-	-	NA	NA	NA	NA
Naphthalene	300	-	300	-	-	340	21,000	340	NA	NA	NA	NA
Pyrene	200	-	200	490	6,017.15 - 40,290	665	2,600	490	NA	NA	NA	NA
Benzo(g,h,i)perylene	-	-	-	170	3,936 - 4,736	-	-	170	NA	NA	NA	NA
Indeno[1,2,3-cd]pyrene	-	-	-	200	3,937 - 4,736	-	-	200	NA	NA	NA	NA
Benzo[b]fluoranthene	-	0.2	0.2	-	-	-	-	-	NA	NA	NA	NA
Fluoranthene	300	-	300	750	7,220.58 - 48,348	600	5,100	600	NA	NA	NA	NA
Benzo[k]fluoranthene	-	0.2	0.2	240	9,485.86 -63,516	-	-	240	NA	NA	NA	NA
Chrysene	20	0.2	0.2	340	5,658 - 21,804	384	2,800	340	NA	NA	NA	NA
Benzo(a)pyrene	-	0.02	0.02	370	10193.76 - 68,256	400	2,500	370	NA	NA	NA	NA
Benzo[a]anthracene	-	0.1	0.1	320	10,476.92 - 70,152	261	1,600	261	NA	NA	NA	NA
Phenanthrene	-	-	-	560	6,725.05 - 45,030	240	1,500	240	NA	NA	NA	NA
Anthracene	2,000	-	2,000	220	4,551 - 5,476	85	1,100	85	NA	NA	NA	NA
Acenaphthene	400	-	400	-	-	-	-	-	NA	NA	NA	NA
Dibenz[a,h]anthracene	-	0.3	0.3	-	-	-	-	-	NA	NA	NA	NA
Diethylphthalate	5,000	-	5,000	-	-	-	-	-	NA	NA	NA	NA
butyl benzyl pthalate	-	100	100	-	-	-	-	-	NA	NA	NA	NA
Fluorene	300	-	300	-	-	-	-	-	NA	NA	NA	NA
Phenol	4,000	-	4,000	-	-	-	-	-	NA	NA	NA	NA
Pesticides												
alpha-BHC	NA	NA	NA	0.006	598	-	-	0.006	NA	NA	NA	NA
gamma-BHC (Lindane)	NA	NA	NA	0.003	47.3	-	-	0.003	NA	NA	NA	NA
alpha-Chlordane	NA	NA	NA	0.007	195-393.6	-	-	0.007	NA	NA	NA	NA
gamma-chlordane	NA	NA	NA	0.007	258-425.4	-	-	0.007	NA	NA	NA	NA
4,4'-DDT	NA	NA	NA	0.008	1290.5	1.5	46.1	0.008	NA	NA	NA	NA
4,4'-DDD	NA	NA	NA	0.008	195-425.4	0.0022	0.027	0.0022	NA	NA	NA	NA
4,4'-DDE	NA	NA	NA	0.005	233.7	0.0022	0.027	0.0022	NA	NA	NA	NA
Dieldren	NA	NA	NA	0.002	3,193	-	-	0.002	NA	NA	NA	NA
Endrin	NA	NA	NA	0.003	393.61-8,580	-	-	0.003	NA	NA	NA	NA
Endrin aldehyde	NA	NA	NA	0.003	4,433-8,528	-	-	0.003	NA	NA	NA	NA
Heptchlor	NA	NA	NA	-	-	-	-	-	NA	NA	NA	NA
Endosulfan Sulfate	NA	NA	NA	-	-	-	-	-	NA	NA	NA	NA
"Total" Inorganics												
Aluminum	200	-	-	-	-	-	-	-	-	87	-	87
Antimony	20	6	6	-	-	-	-	-	-	12.2	6	6

TABLE 8
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
ARARs/TBCs FOR GROUNDWATER, SEDIMENT, AND SURFACE WATER
(Sheet 2 of 2)

Material	Groundwater			Sediment					Surface Water			
	New Jersey GWQS	Federal MCLs	Most Stringent	Canadian LEL	Canadian SEL	ER-L	ER-M	Most Stringent	Minimum SWAQD	Minimum SWAQT	Minimum SWHHT	Most Stringent
Arsenic	8	10**	8	6	33	8.2	70	6	-	36	0.017	0.017
Barium	2,000	2,000	2,000	-	-	-	-	-	-	-	2,000	2,000
Beryllium	20	4	4	-	-	-	-	-	-	-	-	-
Cadmium	4	5	4	0.6	10	1.2	9.6	0.6	0.54	0.57	5	0.54
Calcium	-	-	-	-	-	-	-	-	-	-	-	-
Chromium	100	100	100	26	110	81	370	26	10	10	100	10
Copper	1,000	1300*	1,000	16	110	34	270	16	4.47	4.45	1300	4.45
Iron	300		300	20,000	40,000	-	-	20,000	-	-	300	300
Lead	10	15*	10	31	250	46.7	218	31	0.97	1.05	5	0.97
Manganese	50	-	50	460	1,100	-	-	460	-	-	50	50
Mercury	2	2	-	0.2	2	0.15	0.71	0.15	0.012	0.012	0.012	0.012
Nickel	100	-	100	16	75	20.9	51.6	16	7	8.2	100	7
Selenium	50	50	50	-	-	-	-	-	5	5	10	5
Silver	2	-	2	-	-	-	-	-	1.9	1.9	164	1.9
Sodium	50,000	-	50,000	-	-	-	-	-	-	-	-	-
Zinc	5,000	-	5,000	-	-	-	-	-	50.11	50.82	9,100	81
"Dissolved" Inorganics												
Aluminum	200	-	-	NA	NA	NA	NA	NA	-	87	-	87
Antimony	20	6	6	NA	NA	NA	NA	NA	-	12.2	6	6
Arsenic	8	10**	8	NA	NA	NA	NA	NA	-	36	0.017	0.017
Barium	2,000	2,000	2,000	NA	NA	NA	NA	NA	-	-	2,000	2,000
Beryllium	20	4	4	NA	NA	NA	NA	NA	-	-	-	-
Cadmium	4	5	4	NA	NA	NA	NA	NA	0.54	0.57	5	0.54
Calcium	-	-	-	NA	NA	NA	NA	NA	-	-	-	-
Chromium	100	100	100	NA	NA	NA	NA	NA	10	10	100	10
Copper	1,000	1300*	1,000	NA	NA	NA	NA	NA	4.47	4.45	1300	4.45
Iron	300	-	300	NA	NA	NA	NA	NA	-	-	300	300
Lead	10	15*	10	NA	NA	NA	NA	NA	0.97	1.05	5	0.97
Manganese	50	-	50	NA	NA	NA	NA	NA	-	-	50	50
Mercury	2	2	-	NA	NA	NA	NA	NA	0.012	0.012	0.012	0.012
Nickel	100	-	100	NA	NA	NA	NA	NA	7	8.2	100	7
Selenium	50	50	50	NA	NA	NA	NA	NA	5	5	10	5
[illegible]er	2	-	2	NA	NA	NA	NA	NA	1.9	1.9	164	1.9
Sodium	50,000	-	50,000	NA	NA	NA	NA	NA	-	-	-	-
Zinc	5,000	-	5,000	NA	NA	NA	NA	NA	50.11	50.82	9100	81

Notes:

MIN-SWAQD: based on most stringent criteria comparing aquatic - dissolved standards from NAWQC and DRBC
MIN-SWAQT: based on most stringent criteria comparing aquatic -total standards from New Jersey, NAWQC and DRBC
MIN-SWHHT: based on most stringent criteria comparing human health standards from New Jersey, NAWQC and DRBC
DRBC: Delaware River Basin Compact NJSA 58:18
NAWQC: National Ambient Water Quality Guidance Criteria
NJGWQS: New Jersey Groundwater Quality Standard: NJAC 7:9-6
MCL: United States Environmental Protection Agency Minimum Contaminant Level: 40 CFR 141
ER-M: Effects Range - Median
ER-L: Effects Range - Low
LEL: Low Effects Level
SEL: Severe Effects Level
All values are represented as ug/l (parts per billion)

*: Action Level, not MCL
**The federal MCL for arsenic, which was modified 1/22/01 from 50 ppb to 10 ppb, becomes effective 1/23/06. The analytical results were compared to the State standard of 8 ppb, the most stringent groundwater standard for arsenic.

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TABLE 9.1
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
Sediment Concentrations Compared to Ecological Screening Values for Main Channel Stations (1989)
(Page 1 of 4)

Sample ID Date Sampled	Units	Canadian LEL	Canadian SEL	ER-L	ER-M	Reference RS-SD-0101 5/22/89	Q	RS-SD-1001 5/24/89	Q	RS-SD-1101 5/18/89	Q	RS-SD-1201 5/23/89	Q	RS-SD-1301 5/23/89	Q	RS-SD-1401 5/24/89	Q	RS-SD-1402 5/24/89	Q
Semivolatile Organic Compounds																			
Pentachlorophenol	ug/kg	NC	NC	NC	NC	110	J	4300	R	2500	U	7300	R	7000	R	2200	U	ND	
4-methylphenol	ug/kg	NC	NC	NC	NC	170	J	220	R	NA		1500	R	200	R	NA		NA	
Di-n-butylphthalate	ug/kg	NC	NC	NC	NC	73	J	890	R	86	J	1500	R	1400	R	450	U	430	U
Butyl Benzyl Phthalate	ug/kg	NC	NC	NC	NC	110	J	890	R	520	U	1500	R	1400	R	450	U	430	U
Bis(2-ethylhexyl) Phthalate	ug/kg	NC	NC	NC	NC	1200		1500	R	1400	U	1300	R	2200	R	110	J	100	J
Naphthalene sv	ug/kg	NC	NC	340	2100	660	U	890	R	520	U	1500	R	1400	R	450	U	430	U
Pyrene	ug/kg	490	6017.15 - 40290	665	2600	510	J	450	R	320	J	340	R	680	R	100	J	170	J
Benzo(g,h,i)perylene	ug/kg	170	3936 - 4736	NC	NC	660	U	890	R	130	J	1500	R	1400	R	450	U	430	U
Indeno[1,2,3-cd]pyrene	ug/kg	200	3937 - 4736	NC	NC	660	U	890	R	130	J	1500	R	1400	R	450	U	430	U
Benzo[b]fluoranthene	ug/kg	NC	NC	NC	NC	390	J	380	R	190	J	180	R	360	R	130	J	150	J
Fluoranthene	ug/kg	750	7220.58 - 48348	600	5100	430	J	410	R	580		390	R	680	R	88	J	170	J
Benzo[k]fluoranthene	ug/kg	240	9485.86 - 63516	NC	NC	230	J	420	R	280	J	250	R	390	R	130	J	150	J
Chrysene	ug/kg	340	5658 - 21804	384	2800	280	J	550	R	250	J	240	R	440	R	46	J	430	U
Benzo(a)pyrene	ug/kg	370	10193.76 - 68256	400	2500	220	J	320	R	250	J	210	R	390	R	450	U	49	J
Benzo[a]anthracene	ug/kg	320	10476.92 - 70152	261	1600	220	J	300	R	220	J	210	R	360	R	54	J	70	J
Phenanthrene	ug/kg	560	6725.05 - 45030	240	1500	200	J	200	R	270	J	210	R	430	R	57	J	150	J
Anthracene	ug/kg	220	4551 - 5476	85	1100	660	U	890	R	55	J	1500	R	1400	R	450	U	430	U
Total TICs	ug/kg	NC	NC	NC	NC	13980	JN	NA		13090	JN	NA		NA		1600	JN	2000	JN
Pesticides																			
4,4'-DDE	ug/kg	0.005	233.7	0.0022	0.027	32	U	43	R	100		36	R	35	R	22	U	21	U
Metals																			
Aluminum	mg/kg	NC	NC	NC	NC	11000	J	17200	J	10600		16500	J	16500	J	8070		7390	
Calcium	mg/kg	NC	NC	NC	NC	3950	J	3830	J	2390		3920	J	3360	J	1010		1220	
Iron	mg/kg	20000	40000	NC	NC	26600	J	36900	J	23700		33600	J	35600	J	14700		13100	
Magnesium	mg/kg	NC	NC	NC	NC	3700	J	4400	J	4010		4470	J	4180	J	2600		2340	
Potassium	mg/kg	NC	NC	NC	NC	873	J	1450	J	2820		1570	J	1960	J	942	J	792	J
Barium	mg/kg	NC	NC	NC	NC	126	J	179	J	114		177	J	176	J	52.5	J	51.6	J
Manganese	mg/kg	460	1100	NC	NC	780	J	958	J	670		1310	J	968	J	250		240	
Arsenic	mg/kg	6	33	8.2	70	6.4	J	10.3	J	9.7	R	8.3	J	8.4	J	2.1		2.4	
Beryllium	mg/kg	NC	NC	NC	NC	1.7	J	2.6	J	2.6		2.4	J	4.4	J	0.35	U	0.5	
Cadmium	mg/kg	0.6	10	1.2	9.6	6.6	J	9.3	J	4.9	J	7.9	J	8.2	J	1.4	U	1.2	U
Chromium	mg/kg	26	110	81	370	28.8	J	63.6	J	42.4		59.1	J	80	J	12		12.6	
Cobalt	mg/kg	NC	NC	NC	NC	17.2	J	21.1	J	14.4	J	20.6	J	19.9	J	8.2		9.3	
Copper	mg/kg	16	110	34	270	53.5	J	86.1	J	60.9		86.4	J	97.9	J	9.2		12.6	
Lead	mg/kg	31	250	46.7	218	96.7	J	129	J	76.5		135	J	170	J	11.7	J	14	J
Mercury	mg/kg	0.2	2	0.15	0.71	0.2	J	0.3	J	0.2	U	0.4	J	1.3	J	0.2	U	0.1	U
Nickel	mg/kg	16	75	20.9	51.6	31	J	45.2	J	30	J	40.2	J	46	J	14.7		13.4	

NC=No criteria;NA=Not Analyzed;U/UJ=Below detect.limit;XJ/J=Est.concen.;JN=Presump.evidence for compound;R=Rejected data; Note: SEL normalized to station specific TOC
Bold= >LEL;
Bold/Shaded= >SEL

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TABLE 9.1
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
Sediment Concentrations Compared to Ecological Screening Values for Main Channel Stations (1989)

Sample ID Date Sampled	Units	Canadian LEL	Canadian SEL	ER-L	ER-M	Reference RS-SD-0101 Q 5/22/89	RS-SD-1001 Q 5/24/89	RS-SD-1101 Q 5/18/89	RS-SD-1201 Q 5/23/89	RS-SD-1301 Q 5/23/89	RS-SD-1401 Q 5/24/89	RS-SD-1402 Q 5/24/89
Vanadium	mg/kg	NC	NC	NC	NC	25.2 J	40.2 J	33	40.2 J	46.8 J	13 J	13 J
Zinc	mg/kg	120	820	150	410	**662** J	**811** J	**566**	**752** J	**1060** J	70.9	82.1
Other												
Total Organic Carbon	mg/kg	NC	NC	NC	NC	47400	28600 J J	12300	39700	34700	NA	7079 J
Percent Solids	%	NC	NC	NC	NC	46.8	37.7	59.4	47	45.3	57.2	67.8

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NC=No criteria;NA=Not Analyzed;U/UJ=Below detect.limit;XJ/J=Est.concen.;JN=Presump.evidence for compound;R=Rejected data; Note: SEL normalized to station specific TOC
Bold= >LEL;
Bold/Shaded= >SEL

TABLE 9.1
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
Sediment Concentrations Compared to Ecological Screening Values for Main Channel Stations (1989)
(Page 3 of 4)

Sample ID Date Sampled	Units	Canadian LEL	Canadian SEL	ER-L	ER-M	RS-SD-1501 5/24/89	Q	RS-SD-0201 5/22/89	Q	RS-SD-0401 5/22/89	Q	RS-SD-04A01 5/25/89	Q	RS-SD-09A01 5/25/89	Q
Semivolatile Organic Compounds															
Pentachlorophenol	ug/kg	NC	NC	NC	NC	3300	R	6700	R	2100	U	2400	U	3800	R
4-methylphenol	ug/kg	NC	NC	NC	NC	80	R	280	R	NA		61	J	790	R
Di-n-butylphthalate	ug/kg	NC	NC	NC	NC	670	R	1400	R	50	J	490	U	790	R
Butyl Benzyl Phthalate	ug/kg	NC	NC	NC	NC	120	R	1400	R	71	J	490	U	790	R
Bis(2-ethylhexyl) Phthalate	ug/kg	NC	NC	NC	NC	2000	R	3100	R	840		660	J	780	R
Naphthalene sv	ug/kg	NC	NC	340	2100	670	R	1400	R	430	U	55	J	790	R
Pyrene	ug/kg	490	6017.15 - 40290	665	2600	690	R	660	R	370	J	300	J	220	R
Benzo(g,h,i)perylene	ug/kg	170	3936 - 4736	NC	NC	200	R	1400	R	96	J	490	U	790	R
Indeno[1,2,3-cd]pyrene	ug/kg	200	3937 - 4736	NC	NC	200	R	1400	R	93	J	490	U	790	R
Benzo[b]fluoranthene	ug/kg	NC	NC	NC	NC	1400	R	910	R	260	J	110	J	180	R
Fluoranthene	ug/kg	750	7220.58 - 48348	600	5100	660	R	720	R	380	J	280	J	210	R
Benzo[k]fluoranthene	ug/kg	240	9485.86 - 63516	NC	NC	1400	R	910	R	170	J	130	J	110	R
Chrysene	ug/kg	340	5658 - 21804	384	2800	420	R	510	R	200	J	180	J	140	R
Benzo(a)pyrene	ug/kg	370	10193.76 - 68256	400	2500	390	R	480	R	180	J	130	J	95	R
Benzo[a]anthracene	ug/kg	320	10476.92 - 70152	261	1600	340	R	420	R	200	J	180	J	110	R
Phenanthrene	ug/kg	560	6725.05 - 45030	240	1500	310	R	400	R	230	J	110	J	91	R
Anthracene	ug/kg	220	4551 - 5476	85	1100	670	R	1400	R	73	J	490	U	790	R
Total TICs	ug/kg	NC	NC	NC	NC	NA		NA		14380	JN	17840	JN	NA	
Pesticides															
4,4'-DDE	ug/kg	0.005	233.7	0.0022	0.027	35	R	67	R	21	U	24	U	38	R
Metals															
Aluminum	mg/kg	NC	NC	NC	NC	13000	J	13000	J	9300		6970		11600	J
Calcium	mg/kg	NC	NC	NC	NC	3290	J	5190	J	1830		2480		3360	J
Iron	mg/kg	20000	40000	NC	NC	**28800**	J	**35000**	J	**29100**	J	**20800**		**27500**	J
Magnesium	mg/kg	NC	NC	NC	NC	3840	J	4210	J	4290		2220		3400	J
Potassium	mg/kg	NC	NC	NC	NC	1330	J	1190	J	4000	J	868	J	1180	J
Barium	mg/kg	NC	NC	NC	NC	156	J	166	J	109	J	81.4	J	135	J
Manganese	mg/kg	460	1100	NC	NC	**1050**	J	**814**	J	336		714		**1330**	J
Arsenic	mg/kg	6	33	8.2	70	5.6	J	**9**	J	2.4		4.4		**7.2**	J
Beryllium	mg/kg	NC	NC	NC	NC	1.7	J	1.9	J	0.92		0.85		1.6	J
Cadmium	mg/kg	0.6	10	1.2	9.6	**6.1**	J	**8.1**	J	**2**	J	**2.4**	J	**6**	J
Chromium	mg/kg	26	110	81	370	**44.4**	J	**40.5**	J	**32.8**		22.4		**39.3**	J
Cobalt	mg/kg	NC	NC	NC	NC	16.5	J	18.7	J	16		10.3		15.9	J
Copper	mg/kg	16	110	34	270	**66.4**	J	**73.4**	J	**32.9**	J	**34.5**	J	**58.3**	J
Lead	mg/kg	31	250	46.7	218	**103**	J	**88.5**	J	**40.7**		**48.4**		**90**	J
Mercury	mg/kg	0.2	2	0.15	0.71	0.2	J	0.4	UJ	0.2	U	0.2	U	0.2	J
Nickel	mg/kg	16	75	20.9	51.6	**32.6**	J	**37**	J	**31**		**19.2**		**32.2**	J

NC=No criteria;NA=Not Analyzed;U/UJ=Below detect.limit;XJ/J=Est.concen.;JN=Presump.evidence for compound;R=Rejected data; Note: SEL normalized to station specific TOC
Bold= >LEL;
Bold/Shaded= >SEL

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TABLE 9.1
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
Sediment Concentrations Compared to Ecological Screening Values for Main Channel Stations (1989)
(Page 4 of 4)

Sample ID Date Sampled	Units	Canadian LEL	Canadian SEL	ER-L	ER-M	RS-SD-1501 5/24/89	Q	RS-SD-0201 5/22/89	Q	RS-SD-0401 5/22/89	Q	RS-SD-04A01 5/25/89	Q	RS-SD-09A01 5/25/89	Q
Vanadium	mg/kg	NC	NC	NC	NC	32.2	J	25.9	J	38.1	J	17.5	J	29.9	J
Zinc	mg/kg	120	820	150	410	**569**	J	**859**	J	**321**		**321**		**537**	J
Other															
Total Organic Carbon	mg/kg	NC	NC	NC	NC	27100		81300		14800		15400		19500	
Percent Solids	%	NC	NC	NC	NC	42.6		23.4		65.6		57.1		43	

NC=No criteria;NA=Not Analyzed;U/UJ=Below detect.limit;XJ/J=Est.concen.;JN=Presump.evidence for compound;R=Rejected data; Note: SEL normalized to station specific TOC
Bold= >LEL;
Bold/Shaded= >SEL

TABLE 9.2
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
Sediment Concentrations Compared to Ecological Screening Values for Back Channel Stations (1989)
(Page 1 of 4)

Sample ID Date Sampled	Units	Canadian LEL	Canadian SEL	ER-L	ER-M	Reference RS-SD-0101 5/22/89	Q	RS-SD-301 5/22/89	Q	RS-SD-501 5/24/89	Q	RS-SD-601 5/25/89	Q	RS-SD-701 5/24/89	Q
Semivolatile Organic Compounds															
Pentachlorophenol	ug/kg	NC	NC	NC	NC	110	J	2300	U	3600	R	3100	U	3100	U
4-methylphenol	ug/kg	NC	NC	NC	NC	170	J	340	J	140	R	NA		100	J
Di-n-butylphthalate	ug/kg	NC	NC	NC	NC	73	J	460	U	730	R	180	J	650	U
Butyl Benzyl Phthalate	ug/kg	NC	NC	NC	NC	110	J	ND		270	R	ND		ND	
Bis(2-ethylhexyl) Phthalate	ug/kg	NC	NC	NC	NC	1200		880		1300	R	2600	J	930	J
Naphthalene sv	ug/kg	NC	NC	340	2100	660	U	60	J	730	R	630	U	650	U
Pyrene	ug/kg	490	11645 - 40290	665	2600	**510**	J	250	J	510	R	**520**	J	**500**	J
Benzo(g,h,i)perylene	ug/kg	170	4384 - 8736	NC	NC	660	U	80	J	160	R	630	U	140	J
Indeno[1,2,3-cd]pyrene	ug/kg	200	4384 - 15136	NC	NC	660	U	85	J	140	R	85	J	74	J
Benzo[b]fluoranthene	ug/kg	NC	NC	NC	NC	390	J	430	J	1100	R	350	J	1000	J
Fluoranthene	ug/kg	750	13974 - 48348	600	5100	430	J	300	J	470	R	650		490	J
Benzo[k]fluoranthene	ug/kg	240	36582 - 63516	NC	NC	230	J	NA		1100	R	**420**	J	**1000**	J
Chrysene	ug/kg	340	6302 - 21804	384	2800	280	J	230	J	300	R	**420**	J	320	J
Benzo(a)pyrene	ug/kg	370	19728 - 68256	400	2500	220	J	230	J	380	R	290	J	330	J
Dibenz[a,h]anthracene	ug/kg	60	6149	63.4	260	660	U	460	U	ND	R	630	U	650	UJ
Benzo[a]anthracene	ug/kg	320	20276 - 70152	261	1600	220	J	200	J	310	R	**360**	J	270	J
Phenanthrene	ug/kg	560	13015 - 45030	240	1500	200	J	180	J	220	R	230	J	220	J
Anthracene	ug/kg	220	5069 - 16576	85	1100	660	U	51	J	730	R	100	J	650	U
Total TICs	ug/kg	NC	NC	NC	NC	13980	JN	20090	JN	NA		128600	JN	13570	JN
Pesticides															
4,4'-ddt	ug/kg	0.008	3180.8	1.5	46.1	32	U	22	U	ND		**35**		31	U
4,4'-dde	ug/kg	0.005	518.7 - 851.2	0.0022	0.027	32	U	22	U	54	R	**47**		**40**	

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NC=No criteria;NA=Not Analyzed;U/UJ=Below detect. limit;XJ/J=Est.concen.;JN=Presump.evidence for compound; R=Rejected data; Note: SEL normalized to station specific TOC
Bold= >LEL
Bold/Shaded= >SEL

TABLE 9.2
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
Sediment Concentrations Compared to Ecological Screening Values for Back Channel Stations (1989)
(Page 2 of 4)

Sample ID Date Sampled	Units	Canadian LEL	Canadian SEL	ER-L	ER-M	Reference RS-SD-0101 5/22/89	Q	RS-SD-301 5/22/89	Q	RS-SD-501 5/24/89	Q	RS-SD-601 5/25/89	Q	RS-SD-701 5/24/89	Q
Metals															
Aluminum	mg/kg	NC	NC	NC	NC	11000	J	8010		12300	J	12200		16400	J
Calcium	mg/kg	NC	NC	NC	NC	3950	J	2520		5890	J	2850		3790	J
Iron	mg/kg	20000	40000	NC	NC	**26600**	J	**31200**		**53000**	J	**196000**		**45300**	J
Magnesium	mg/kg	NC	NC	NC	NC	3700	J	2630		3430	J	3040		4310	J
Potassium	mg/kg	NC	NC	NC	NC	873	J	1730	J	1790	J	1240	J	1530	J
Barium	mg/kg	NC	NC	NC	NC	126	J	88	J	146	J	121	J	182	J
Manganese	mg/kg	460	1100	NC	NC	**780**	J	**590**		**916**	J	**1770**		**743**	J
Antimony	mg/kg	NC	NC	2	25	2	U	7.9	UJ	146	J	11.7	J	10.2	UJ
Arsenic	mg/kg	6	33	8.2	70	**6.4**	J	5.3		**11.9**	J	**17.8**		**11.7**	J
Beryllium	mg/kg	NC	NC	NC	NC	1.7	J	1.5		4.8	J	6.2		8	J
Cadmium	mg/kg	0.6	10	1.2	9.6	**6.6**	J	**3.7**	J	**6.4**	J	**9.6**		**10.8**	J
Chromium	mg/kg	26	110	81	370	**28.8**	J	**32.2**		**103**	J	**168**		**79.6**	J
Cobalt	mg/kg	NC	NC	NC	NC	17.2	J	12.2		18.4	J	32.7		20.6	J
Copper	mg/kg	16	110	34	270	**53.5**	J	**47.5**	J	**461**	J	**475**	J	**137**	J
Lead	mg/kg	31	250	46.7	218	**96.7**	J	**79.2**		**1060**	J	**682**		**252**	J
Mercury	mg/kg	0.2	2	0.15	0.71	0.2	J	0.2	U	**0.3**	J	**0.4**		**0.6**	J
Nickel	mg/kg	16	75	20.9	51.6	**31**	J	**23.5**		**40.4**	J	**135**		**49.8**	J
Vanadium	mg/kg	NC	NC	NC	NC	25.2	J	24.3	J	43	J	37.2	J	40.8	J
Zinc	mg/kg	120	820	150	410	**662**	J	**437**		**935**	J	**1340**		**1290**	J
Other															
Total Organic Carbon	mg/kg	NC	NC	NC	NC	47400		13700		18100		44800		27300	
Percent Solids	%	NC	NC	NC	NC	46.8		60.6		28.5		50.7		47.1	

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NC=No criteria;NA=Not Analyzed;U/UJ=Below detect. limit;XJ/J=Est.concen.;JN=Presump.evidence for compound; R=Rejected data; Note: SEL normalized to station specific TOC
Bold= >LEL
Bold/Shaded= >SEL

TABLE 9.2
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
<u>Sediment Concentrations Compared to Ecological Screening Values for Back Channel Stations (1989)</u>

Sample ID Date Sampled	Units	Canadian LEL	Canadian SEL	ER-L	ER-M	RS-SD-801 5/25/89	Q
Semivolatile Organic Compounds							
Pentachlorophenol	ug/kg	NC	NC	NC	NC	1900	U
4-methylphenol	ug/kg	NC	NC	NC	NC	51	J
Di-n-butylphthalate	ug/kg	NC	NC	NC	NC	400	U
Butyl Benzyl Phthalate	ug/kg	NC	NC	NC	NC	ND	
Bis(2-ethylhexyl) Phthalate	ug/kg	NC	NC	NC	NC	840	J
Naphthalene sv	ug/kg	NC	NC	340	2100	400	U
Pyrene	ug/kg	490	11645 - 40290	665	2600	320	J
Benzo(g,h,i)perylene	ug/kg	170	4384 - 8736	NC	NC	400	U
Indeno[1,2,3-cd]pyrene	ug/kg	200	4384 - 15136	NC	NC	67	J
Benzo[b]fluoranthene	ug/kg	NC	NC	NC	NC	220	J
Fluoranthene	ug/kg	750	13974 - 48348	600	5100	310	J
Benzo[k]fluoranthene	ug/kg	240	36582 - 63516	NC	NC	200	J
Chrysene	ug/kg	340	6302 - 21804	384	2800	290	J
Benzo(a)pyrene	ug/kg	370	19728 - 68256	400	2500	240	J
Dibenz[a,h]anthracene	ug/kg	60	6149	63.4	260	60	J
Benzo[a]anthracene	ug/kg	320	20276 - 70152	261	1600	270	J
Phenanthrene	ug/kg	560	13015 - 45030	240	1500	150	J
Anthracene	ug/kg	220	5069 - 16576	85	1100	400	U
Total TICs	ug/kg	NC	NC	NC	NC	9160	JN
Pesticides							
4,4'-ddt	ug/kg	0.008	3180.8	1.5	46.1	19	U
4,4'-dde	ug/kg	0.005	518.7 - 851.2	0.0022	0.027	19	U

NC=No criteria;NA=Not Analyzed;U/UJ=Below detect. limit;XJ/J=Est.concen.;JN=Presump.evidence for compound; R=Rejected data; Note: SEL normalized to station specific TOC
Bold= >LEL
Bold/Shaded= >SEL

TABLE 9.2
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
Sediment Concentrations Compared to Ecological Screening Values for Back Channel Stations (1989)

Sample ID Date Sampled	Units	Canadian LEL	Canadian SEL	ER-L	ER-M	RS-SD-801 5/25/89	Q
Metals							
Aluminum	mg/kg	NC	NC	NC	NC	10200	J
Calcium	mg/kg	NC	NC	NC	NC	2760	J
Iron	mg/kg	20000	40000	NC	NC	**48700**	J
Magnesium	mg/kg	NC	NC	NC	NC	2930	J
Potassium	mg/kg	NC	NC	NC	NC	1040	J
Barium	mg/kg	NC	NC	NC	NC	114	J
Manganese	mg/kg	460	1100	NC	NC	**731**	J
Antimony	mg/kg	NC	NC	2	25	10.3	UJ
Arsenic	mg/kg	6	33	8.2	70	**7.7**	J
Beryllium	mg/kg	NC	NC	NC	NC	2	J
Cadmium	mg/kg	0.6	10	1.2	9.6	**6.2**	J
Chromium	mg/kg	26	110	81	370	**56**	J
Cobalt	mg/kg	NC	NC	NC	NC	14.7	J
Copper	mg/kg	16	110	34	270	**111**	J
Lead	mg/kg	31	250	46.7	218	**134**	J
Mercury	mg/kg	0.2	2	0.15	0.71	**0.6**	J
Nickel	mg/kg	16	75	20.9	51.6	**37.7**	J
Vanadium	mg/kg	NC	NC	NC	NC	27	J
Zinc	mg/kg	120	820	150	410	**667**	J
Other							
Total Organic Carbon	mg/kg	NC	NC	NC	NC	47300	J
Percent Solids	%	NC	NC	NC	NC	46.6	

NC=No criteria;NA=Not Analyzed;U/UJ=Below detect. limit;XJ/J=Est.concen.;JN=Presump.evidence for compound; R=Rejected data; Note: SEL normalized to station specific TOC
Bold= >LEL
Bold/Shaded= >SEL

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TABLE 9.3
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
Sediment Concentrations Compared to Ecological Screening Values for Crafts Creek Channel Stations (1989)

(Page 1 of 2)

Sample ID Date Sampled	Units	Canadian LEL	Canadian SEL	ER-L	ER-M	RS-SD-16 11/20/89	Q	RS-SD-16D 11/20/89	Q	RS-SD-17 11/20/89	Q	RS-SD-18 11/20/89	Q	RS-SD-19 11/20/89	Q
Semivolatile Organic Compounds															
4-methylphenol	ug/kg	NC	NC	NC	NC	96	J	NA		91	J	NA		NA	
Butyl Benzyl Phthalate	ug/kg	NC	NC	NC	NC	510	UJ	1300	UJ	800	UJ	140	J	380	UJ
Naphthalene sv	ug/kg	NC	NC	340	2100	400	J	2000	J	750	J	880	UJ	380	UJ
2-methylnaphthalene	ug/kg	NC	NC	NC	NC	450	J	2600	J	800	J	880	UJ	380	UJ
Acenaphthene	ug/kg	NC	NC	16	500	510	UJ	1300	UJ	290	J	880	UJ	380	UJ
Fluorene	ug/kg	190	2908.16 - 13062.88	19	540	510	UJ	1300	UJ	**270**	J	140	J	380	UJ
Phenanthrene	ug/kg	560	11282.2 - 95367.65	240	1500	520	J	**1800**	J	**1100**	J	**1100**	J	47	J
Anthracene	ug/kg	220	6725.12 - 30207.91	85	1100	510	UJ	140	J	190	J	180	J	380	UJ
Pyrene	ug/kg	490	10094.60 - 85328.95	665	2600	480	J	**3100**	J	**1200**	J	**2000**	J	79	J
Dibenzofuran	ug/kg	NC	NC	NC	NC	170	J	850	J	460	J	880	UJ	380	UJ
Benzo(g,h,i)perylene	ug/kg	170	5816.32 - 32123.84	NC	NC	**220**	J	**590**	J	**390**	J	**420**	J	380	UJ
Indeno[1,2,3-cd]pyrene	ug/kg	200	5816.32 - 32123.85	NC	NC	120	J	**420**	J	**220**	J	**380**	J	380	UJ
Benzo[b]fluoranthene	ug/kg	NC	NC	NC	NC	470	J	1900	J	1100	J	1300	J	50	J
Fluoranthene	ug/kg	750	12113.52 - 102394.74	600	5100	460	J	**2300**	J	**1300**	J	**2000**	J	81	J
Benzo[k]fluoranthene	ug/kg	240	15913.84 - 134518.58	NC	NC	**250**	J	**1500**	J	**820**	J	**820**	J	41	J
Chrysene	ug/kg	340	5462.96 - 46178.02	384	2800	**520**	J	**2400**	J	**1100**	J	**1200**	J	48	J
Benzo(a)pyrene	ug/kg	370	26173.44 - 144557.28	400	2500	270	J	**920**	J	**470**	J	**820**	J	380	UJ
Benzo[a]anthracene	ug/kg	320	26900.48 - 148572.76	261	1600	**360**	J	**1900**	J	**680**	J	**860**	J	380	UJ
Benzoic Acid	ug/kg	NC	NC	NC	NC	2500	UJ	6400	UJ	150	J	4200	UJ	1900	UJ
Total TICs	ug/kg	NC	NC	NC	NC	55190	JN	95000	JN	257700	JN	87100	JN	42780	JN
Pesticides															
4,4'-ddt	ug/kg	0.008	1290.5	1.5	46.1	250	UJ	320	UJ	390	UJ	**130**	J	19	UJ
PCBs															
Aroclor 1242	ug/kg	NC	NC	NC	NC	1900	J	1600	UJ	2300	J	1100	UJ	93	UJ
Aroclor 1260	ug/kg	0.005	436.22	NC	NC	2500	UJ	3200	UJ	3900	UJ	**880**	J	1900	UJ
Metals															
Aluminum	mg/kg	NC	NC	NC	NC	3780		6190		6160	J	7630		5940	
Calcium	mg/kg	NC	NC	NC	NC	1120		2620		1790	J	5070		342	
Iron	mg/kg	20000	40000	NC	NC	15200		19300		**20700**	J	**25400**		**27000**	

NC=No criteria;NA=Not Analyzed;U/UJ=Below detect. limit;XJ/J=Est.concen.;JN=Presump.evidence for compound;
R=Rejected data; Note: SEL normalized to station specific TOC
Bold= >LEL
Bold/Shaded= >SEL

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TABLE 9.3
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
Sediment Concentrations Compared to Ecological Screening Values for Crafts Creek Channel Stations (1989)
(Page 2 of 2)

Sample ID Date Sampled	Units	Canadian LEL	Canadian SEL	ER-L	ER-M	RS-SD-16 11/20/89	Q	RS-SD-16D 11/20/89	Q	RS-SD-17 11/20/89	Q	RS-SD-18 11/20/89	Q	RS-SD-19 11/20/89	Q
Magnesium	mg/kg	NC	NC	NC	NC	669		1000		974	J	2480		1210	
Potassium	mg/kg	NC	NC	NC	NC	801		707		805	J	1010		1860	
Barium	mg/kg	NC	NC	NC	NC	48.3		93.1		61.7	J	96.4		26.8	
Manganese	mg/kg	460	1100	NC	NC	91.7		111		117	J	223		40.9	
Arsenic	mg/kg	6	33	8.2	70	5.9		**8.1**		**8.4**	J	5.1		4.4	
Beryllium	mg/kg	NC	NC	NC	NC	0.81		1.3		1.2	J	1.2		0.65	
Cadmium	mg/kg	0.6	10	1.2	9.6	0.98	UJ	1	UJ	1.5	UJ	**0.97**	J	0.85	UJ
Chromium	mg/kg	26	110	81	370	19.6		19.8		**27.9**	J	**48**		**28.7**	
Cobalt	mg/kg	NC	NC	NC	NC	3.8		5.1		10.7	J	15.9		3.9	
Copper	mg/kg	16	110	34	270	**276**		**385**		**277**	J	**175**		**26.8**	
Lead	mg/kg	31	250	46.7	218	**431**		**644**		213	J	**580**		**77.6**	
Mercury	mg/kg	0.2	2	0.15	0.71	**4.2**		**4.3**		0.25	UJ	0.14	U	0.14	U
Nickel	mg/kg	16	75	20.9	51.6	10.3	J	14.2	J	**27.5**	J	**40.2**	J	7.9	J
Selenium	mg/kg	NC	NC	NC	NC	0.62	J	0.83	J	1.1	J	0.34	J	0.31	J
Thallium	mg/kg	NC	NC	NC	NC	0.33	U	0.37		0.5	UJ	0.28	U	0.28	U
Vanadium	mg/kg	NC	NC	NC	NC	17.9		23.1		26.1	J	28.3		38	
Zinc	mg/kg	120	820	150	410	**658**	J	**1050**	J	**464**	J	**870**	J	86.3	J
Other															
Total Organic Carbon	mg/kg	NC	NC	NC	NC	100387		73941		81643		18176		11876	
Percent Solids	%	NC	NC	NC	NC	61.2		60.2		40.4		71		70.5	

NC=No criteria;NA=Not Analyzed;U/UJ=Below detect. limit;XJ/J=Est.concen.;JN=Presump.evidence for compound;
R=Rejected data; Note: SEL normalized to station specific TOC
Bold= >LEL
Bold/Shaded= >SEL

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TABLE 10.1
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
Sediment Concentrations Compared to Ecological Screening Values for Back Channel Stations (1996)
(Page 1 of 6)

Sample ID / Date Sampled	Units	Canadian LEL	Canadian SEL	ER-L	ER-M	Reference RCSSD4301 11/27/96	Q	Reference RCSSD4501 11/27/96	Q	Reference RCSSD4601 11/27/96	Q	RCSSD2001 11/20/96	Q	RCSSD2101 11/20/96	Q	RCSSD2201 11/21/96	Q
Semivolatile Organic Compounds																	
Phenol	ug/kg	NC	NC	NC	NC	410	U	620	U	1000	UJ	820	UJ	650	UJ	870	UJ
4-Methylphenol	ug/kg	NC	NC	NC	NC	410	UJ	80	J	64	J	140	J	70	J	82	J
Di-n-butylphthalate	ug/kg	NC	NC	NC	NC	410	U	820	U	1000	UJ	820	R	650	R	94	J
Butylbenzylphthalate	ug/kg	NC	NC	NC	NC	410	U	80	J	70	J	820	R	290	J	160	J
Di-n-octylphthalate	ug/kg	NC	NC	NC	NC	410	U	620	U	1000	UJ	820	R	650	R	53	J
bis(2-Ethylhexyl)phthalate	ug/kg	NC	NC	NC	NC	410	U	1200		1400	J	6600	J	3700	J	1400	J
Naphthalene	ug/kg	NC	NC	160	2100	410	U	58	J	60	J	74	J	49	J	54	J
2-Methylnaphthalene	ug/kg	NC	NC	70	670	410	U	620	U	1000	UJ	820	UJ	650	UJ	46	J
Pyrene	ug/kg	490	24905 - 60265	665	2600	50	J	1000		950	J	820	R	650	R	960	J
Dibenzofuran	ug/kg	NC	NC	NC	NC	410	U	620	U	1000	UJ	820	UJ	650	UJ	870	UJ
Benzo(g,h,i)perylene	ug/kg	170	9376 - 22688	NC	NC	23	J	220	J	250	J	820	R	650	R	500	J
Indeno(1,2,3-cd)pyrene	ug/kg	200	9377 - 22688	NC	NC	24	J	320	J	350	J	820	R	650	R	530	J
Benzo(b)fluoranthene	ug/kg	NC	NC	NC	NC	410	U	300	J	630	J	820	R	650	R	620	J
Fluoranthene	ug/kg	750	29886 - 72318	600	5100	67	J	1100		980	J	820	R	650	R	1100	J
Benzo(k)fluoranthene	ug/kg	240	43550 - 95006	NC	NC	410	U	660		640	J	820	R	650	R	650	J
Acenaphthylene	ug/kg	NC	NC	NC	NC	410	U	36	J	1000	UJ	90	J	47	J	90	J
Chrysene	ug/kg	340	13478 - 32614	384	2800	42	J	660		680	J	820	R	650	R	720	J
Benzo(a)pyrene	ug/kg	370	42192 - 102096	400	2500	40	J	620	J	620	J	820	R	650	R	620	J
Dibenzo(a,h)anthracene	ug/kg	60	4225 - 9217	63.4	260	410	U	620	U	1000	UJ	820	R	650	R	170	J
Benzo(a)anthracene	ug/kg	320	43364 - 104932	261	1600	35	J	570	J	520	J	820	R	650	R	550	J
Acenaphthene	ug/kg	NC	NC	16	500	410	U	40	J	1000	UJ	820	UJ	650	UJ	45	J
Diethylphthalate	ug/kg	NC	NC	NC	NC	410	U	620	U	1000	UJ	820	UJ	650	UJ	52	J
Fluorene	ug/kg	190	5200 - 11344	19	540	410	U	49	J	1000	UJ	820	UJ	650	UJ	63	J
Phenanthrene	ug/kg	560	27835 - 67355	240	1500	27	J	450	J	330	J	500	J	260	J	480	J
Anthracene	ug/kg	220	12025 - 26233	85	1100	410	U	110	J	130	J	820	R	650	R	160	J
Carbazole	ug/kg	NC	NC	NC	NC	410	U	39	J	1000	UJ	820	R	650	R	61	J
Pesticides																	
alpha-BHC	ug/kg	0.006	598	NC	NC	2.1	UJ	3.2	UJ	5.2	UJ	4.2	UJ	3.3	U	4.5	UJ
gamma-BHC (Lindane)	ug/kg	0.003	47.3	NC	NC	2.1	UJ	3.2	UJ	5.2	UJ	4.2	UJ	3.3	U	4.5	UJ
alpha-Chlordane	ug/kg	0.007	195 - 393.6	NC	NC	2.1	U	2.3	J	4.8	J	4.2	UJ	330	U	4.5	UJ
gamma-Chlordane	ug/kg	0.007	258 - 425.4	NC	NC	2.1	U	1.8	J	4.7	J	4.2	UJ	3.9	J	4.5	J
4,4'-DDT	ug/kg	0.008	3152.4 - 5033.9	1.5	46.1	4.1	U	110		250	J	16	J	6.5	U	11	J
4,4'-DDD	ug/kg	0.008	195 - 425.4	0.0022	0.027	4.1	U	8.4	JN	20	J	8.2	UJ	6.7	R	9.5	J
4,4'-DDE	ug/kg	0.005	617.5 - 1347.1	0.0022	0.027	4.1	U	6.6	JN	13	JN	12	JN	18		18	JN
Dieldrin	ug/kg	0.002	3913	NC	NC	4.1	U	6.2	UJ	10	UJ	8.2	UJ	3.3	U	8.7	UJ
Endrin	ug/kg	0.003	393.61 - 8580	NC	NC	4.1	U	6.2	U	16	J	8.2	UJ	7.1		8.7	UJ
Endrin aldehyde	ug/kg	0.003	4433 - 8528	NC	NC	4.1	U	27		31	JN	8.2	UJ	3.9	U	8.7	UJ
Heptachlor	ug/kg	NC	NC	NC	NC	2.1	U	3.2	U	5.2	UJ	4.2	UJ	3.3	U	4.5	UJ
Endosulfan sulfate	ug/kg	NC	NC	NC	NC	4.1	U	6.2	U	10	UJ	8.2	UJ	12		8.9	J

NC=No criteria;NA=Not Analyzed;U/UJ=Below detect. limit;XJ/J=Est.concen.;JN= Presump.evidence for compound;R=Rejected data; Note: SEL normalized to station specific TOC
Bold= >LEL
Bold/Shaded= >SEL

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TABLE 10.1
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
Sediment Concentrations Compared to Ecological Screening Values for Back Channel Stations (1996)
(Page 2 of 6)

Sample ID / Date Sampled	Units	Canadian LEL	Canadian SEL	ER-L	ER-M	Reference [illegible] 11/27/96		Reference [illegible] 11/27/96		Reference [illegible] 11/27/96		[illegible] 11/22/96		[illegible]		[illegible] 11/21/96	
PCBs																	
Aroclor-1254	ug/kg	0.06	1105 - 2410.6	NC	NC	41	U	62	U	100	UJ	65	J	85	J	70	J
Metals																	
Aluminum	mg/kg	NC	NC	NC	NC	4670		12000		20300	J	14800	J	8150	J	15300	J
Calcium	mg/kg	NC	NC	NC	NC	828		3020		5990	J	3360	J	3160	J	3890	J
Iron	mg/kg	20000	40000	NC	NC	15800		**26500**		**34400**	J	**39700**	J	**68000**	J	**62700**	J
Magnesium	mg/kg	NC	NC	NC	NC	1820		3680		4810	J	4220	J	3530	J	4230	J
Potassium	mg/kg	NC	NC	NC	NC	648		1550		2380	J	1770	J	1050	J	1810	J
Sodium	mg/kg	NC	NC	NC	NC	22.6		61.1		150	J	383	J	351	J	398	J
Barium	mg/kg	NC	NC	NC	NC	32.5		114		174	J	166	J	91	J	175	J
Manganese	mg/kg	460	1100	NC	NC	201		**580**		**1190**	J	**1250**	J	**1300**	J	**1230**	J
Antimony	mg/kg	NC	NC	2	25	12	U	12	U	12	U	1.3	UJ	1	UJ	1.2	UJ
Arsenic	mg/kg	6	33	8.2	70	2		6		**8.2**	J	**8.7**	J	**9.6**	J	**10.8**	J
Beryllium	mg/kg	NC	NC	NC	NC	0.47		1.5		2.4	J	2	J	1.2	J	2.2	J
Cadmium	mg/kg	0.6	10	1.2	9.6	0.57	U	**3.4**		**7.1**	J	**4.9**	J	**3.1**	J	**5.4**	R
Chromium	mg/kg	26	110	81	370	11.4		**29.7**		**46.2**	J	**45.9**	J	**151**	J	**54.5**	J
Cobalt	mg/kg	NC	NC	NC	NC	7.5		14.8		24.3	J	21.2	J	15.3	J	22.3	J
Copper	mg/kg	16	110	34	270	14.9	J	**42**	J	**76.6**	J	**88.9**	J	**166**	J	**122**	J
Lead	mg/kg	31	250	46.7	218	**33.3**		**56.8**		**83.6**	J	**108**	J	**102**	J	**142**	J
Mercury	mg/kg	0.2	2	0.15	0.71	0.06	U	0.18		**0.29**	J	0.14	UJ	0.1	UJ	0.19	J
Nickel	mg/kg	16	75	20.9	51.6	15.9		**29.2**		**34.3**	J	**36.5**	J	**41.4**	J	**42.2**	J
Selenium	mg/kg	NC	NC	NC	NC	0.33	J	0.34	J	0.79	J	1.8	UJ	1.4	UJ	2	J
Silver	mg/kg	NC	NC	1	3.7	2	U	2	U	2	U	2.7	J	2.9	J	3.1	J
Thallium	mg/kg	NC	NC	NC	NC	0.64		1.2	J	1.5	J	1.4	UJ	1.1	UJ	1.3	UJ
Vanadium	mg/kg	NC	NC	NC	NC	8.7		24.4		37.1	J	35.4	J	25.5	J	38.5	J
Zinc	mg/kg	120	820	150	410	**182**		**518**		**903**	J	**741**	J	**601**	J	**831**	J
Other																	
Total Organic Carbon	mg/kg	NC	NC	NC	NC	29300		65600		60300		44400		63800		70900	
Sediment Particle Size >0.0625	%dryw	NC	NC	NC	NC	97.5		56.2		17.8		18.8		54.3		27.4	
Sediment Particle Size 0.0039	%dryw	NC	NC	NC	NC	1.9		34.7		74.5		76.7		42.9		64.4	
Sediment Particle Size <0.0039	%dryw	NC	NC	NC	NC	0.6		9.1		7.7		4.5		2.8		8.2	

NC=No criteria;NA=Not Analyzed;U/UJ=Below detect. limit;XJ/J=Est.concen.;JN= Presump.evidence for compound;R=Rejected data; Note: SEL normalized to station specific TOC
Bold= >LEL
Bold/Shaded= >SEL

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TABLE 10.1
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
Sediment Concentrations Compared to Ecological Screening Values for Back Channel Stations (1996)

Sample ID Date Sampled	Units	Canadian LEL	Canadian SEL	ER-L	ER-M	RCSSD2301 11/20/96	Q	RCSSD2401 11/20/96	Q	RCSSD2501 11/21/96	Q	RCSSD2601 11/22/96	Q	RCSSD2701 11/22/96	Q	RCSSD2801 11/25/96	Q
Semivolatile Organic Compounds																	
Phenol	ug/kg	NC	NC	NC	NC	940	UJ	700	UJ	590	UJ	920	UJ	420	U	800	UJ
4-Methylphenol	ug/kg	NC	NC	NC	NC	140	J	91	J	96	J	89	J	420	U	100	J
Di-n-butylphthalate	ug/kg	NC	NC	NC	NC	940	R	700	UJ	72	J	920	UJ	420	U	800	UJ
Butylbenzylphthalate	ug/kg	NC	NC	NC	NC	400	J	180	J	590	UJ	920	UJ	81	J	800	UJ
Di-n-octylphthalate	ug/kg	NC	NC	NC	NC	940	R	700	UJ	590	UJ	920	UJ	420	UJ	800	UJ
bis(2-Ethylhexyl)phthalate	ug/kg	NC	NC	NC	NC	5500	J	1500	UJ	1800	J	1500	J	420	UJ	1100	J
Naphthalene	ug/kg	NC	NC	160	2100	73	J	96	J	66	J	60	J	420	U	66	J
2-Methylnaphthalene	ug/kg	NC	NC	70	670	940	UJ	71	J	54	J	920	UJ	420	U	42	J
Pyrene	ug/kg	490	24905 - 60265	665	2600	940	R	1500	J	670	J	820	J	100	J	690	J
Dibenzofuran	ug/kg	NC	NC	NC	NC	940	UJ	54	J	32	J	920	UJ	420	U	800	UJ
Benzo(g,h,i)perylene	ug/kg	170	9376 - 22688	NC	NC	940	R	550	J	270	J	330	J	420	U	180	J
Indeno(1,2,3-cd)pyrene	ug/kg	200	9377 - 22688	NC	NC	940	R	560	J	230	J	330	J	420	U	220	J
Benzo(b)fluoranthene	ug/kg	NC	NC	NC	NC	940	R	980	J	590	UJ	880	J	45	J	380	J
Fluoranthene	ug/kg	750	29886 - 72318	600	5100	940	R	1600	J	510	J	790	J	72	J	660	J
Benzo(k)fluoranthene	ug/kg	240	43550 - 95006	NC	NC	940	R	810	J	500	J	920	UJ	39	J	380	J
Acenaphthylene	ug/kg	NC	NC	NC	NC	100	J	190	J	45	J	94	J	420	U	800	UJ
Chrysene	ug/kg	340	13478 - 32614	384	2800	940	R	1000	J	330	J	520	J	65	J	420	J
Benzo(a)pyrene	ug/kg	370	42192 - 102096	400	2500	940	R	940	J	310	J	460	J	420	U	360	J
Dibenzo(a,h)anthracene	ug/kg	60	4225 - 9217	63.4	260	940	R	230	J	73	J	120	J	420	U	800	UJ
Benzo(a)anthracene	ug/kg	320	43364 - 104932	261	1600	940	R	850	J	240	J	410	J	420	UJ	320	J
Acenaphthene	ug/kg	NC	NC	16	500	940	UJ	700	UJ	590	UJ	920	UJ	420	U	800	UJ
Diethylphthalate	ug/kg	NC	NC	NC	NC	940	UJ	48	J	590	UJ	920	UJ	420	U	800	UJ
Fluorene	ug/kg	190	5200 - 11344	19	540	940	UJ	110	J	48	J	50	J	420	U	800	UJ
Phenanthrene	ug/kg	560	27835 - 67355	240	1500	520	J	830	J	270	J	360	J	72	J	800	UJ
Anthracene	ug/kg	220	12025 - 26233	85	1100	940	R	340	J	100	J	130	J	420	U	60	J
Carbazole	ug/kg	NC	NC	NC	NC	940	R	86	J	590	UJ	920	UJ	420	U	800	UJ
Pesticides																	
alpha-BHC	ug/kg	0.006	598	NC	NC	4.8	UJ	3.8	UJ	3	U	4.7	UJ	2.2	U	4.1	UJ
gamma-BHC (Lindane)	ug/kg	0.003	47.3	NC	NC	4.8	UJ	3.8	UJ	3	U	4.7	UJ	2.2	U	4.1	UJ
alpha-Chlordane	ug/kg	0.007	195 - 393.6	NC	NC	4.8	UJ	3.8	UJ	3.7	J	4.7	UJ	2.2	U	4.1	UJ
gamma-Chlordane	ug/kg	0.007	258 - 425.4	NC	NC	4.8	UJ	4.9	JN	3	U	4.7	UJ	2.2	U	3	J
4,4'-DDT	ug/kg	0.008	3152.4 - 5033.9	1.5	46.1	14	JN	7	UJ	5.9	U	9.2	UJ	4.2	U	8	UJ
4,4'-DDD	ug/kg	0.008	195 - 425.4	0.0022	0.027	12	J	13	J	19		9.2	UJ	4.2	U	4.5	J
4,4'-DDE	ug/kg	0.005	617.5 - 1347.1	0.0022	0.027	24	J	26	J	43		14	J	4.2	U	14	J
Dieldrin	ug/kg	0.002	3913	NC	NC	9.4	UJ	7	UJ	5.9	U	9.2	UJ	4.2	U	0.66	J
Endrin	ug/kg	0.003	393.61 - 8580	NC	NC	9.4	UJ	7	J	12		9.2	UJ	4.2	U	7.4	J
Endrin aldehyde	ug/kg	0.003	4433 - 8528	NC	NC	9.4	UJ	7	UJ	5.9	U	28		4.7	JN	20	JN
Heptachlor	ug/kg	NC	NC	NC	NC	4.8	UJ	5.8	J	3	U	4.7	UJ	2.2	U	0.83	J
Endosulfan sulfate	ug/kg	NC	NC	NC	NC	9.4	UJ	8.6	J	5.9	U	9.2	UJ	4.2	U	8	UJ

NC=No criteria;NA=Not Analyzed;U/UJ=Below detect. limit;XJ/J=Est.concen.;JN= Presump.evidence for compound;R=Rejected data; Note: SEL normalized to station specific TOC
Bold= >LEL
Bold/Shaded= >SEL

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TABLE 10.1
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
Sediment Concentrations Compared to Ecological Screening Values for Back Channel Stations (1996)

Sample ID / Date Sampled	Units	Canadian LEL	Canadian SEL	ER-L	ER-M	RCSSD2301 11/20/96	Q	RCSSD2401 11/20/96	Q	RCSSD2501 11/21/96	Q	RCSSD2601 11/22/96	Q	RCSSD2701 11/22/96	Q	RCSSD2801 11/25/96	Q
PCBs																	
Aroclor-1254	ug/kg	0.06	1105 - 2410.6	NC	NC	49	JN	82	J	120	JN	48	JN	13	JN	80	UJ
Metals																	
Aluminum	mg/kg	NC	NC	NC	NC	14200	J	8370	J	9480	J	17900	J	2710		18800	J
Calcium	mg/kg	NC	NC	NC	NC	2870	J	1730	J	1390	J	2610	J	1830	J	3090	J
Iron	mg/kg	20000	40000	NC	NC	37900	J	51600	J	140000	J	47700	J	301000		45600	J
Magnesium	mg/kg	NC	NC	NC	NC	3780	J	2440	J	2360	J	4230	J	1500	J	4900	J
Potassium	mg/kg	NC	NC	NC	NC	1860	J	1240	J	1360	J	2250	J	345		2260	J
Sodium	mg/kg	NC	NC	NC	NC	455	J	332	J	796	J	444	J	220		95.1	J
Barium	mg/kg	NC	NC	NC	NC	147	J	101	J	79.6	J	173	J	58.1		161	J
Manganese	mg/kg	460	1100	NC	NC	952	J	673	J	1150	J	1180	J	1900		945	J
Antimony	mg/kg	NC	NC	2	25	1.5	UJ	1.1	UJ	0.95	J	1.4	UJ	6	J	27.5	UJ
Arsenic	mg/kg	6	33	8.2	70	8	J	8.2	J	24.5	J	11.1	J	76		9.7	J
Beryllium	mg/kg	NC	NC	NC	NC	1.9	J	1.4	J	5.8	J	2.3	J	1.2		2.3	J
Cadmium	mg/kg	0.6	10	1.2	9.6	4.2	J	3.2	J	6.4	R	6.1	J	4.7		5.1	J
Chromium	mg/kg	26	110	81	370	41.7	J	41.7	J	91.6	J	55.6	J	203		54.6	J
Cobalt	mg/kg	NC	NC	NC	NC	17.8	J	14.5	J	26.8	J	22.7	J	27.6		20.9	J
Copper	mg/kg	16	110	34	270	83.6	J	99.5	J	257	J	101	J	366	J	94.9	J
Lead	mg/kg	31	250	46.7	216	112	J	94	J	340	J	132	J	166		126	J
Mercury	mg/kg	0.2	2	0.15	0.71	0.16	UJ	0.11	UJ	0.17	J	0.15	UJ	0.07	U	0.23	J
Nickel	mg/kg	16	75	20.9	51.6	32.2	J	39.4	J	[illegible]	J	40.1	J	160		37.5	J
Selenium	mg/kg	NC	NC	NC	NC	2	UJ	1.5	J	1.8	J	1.9	UJ	0.84	U	0.61	J
Silver	mg/kg	NC	NC	1	3.7	2.5	J	2.7	J	5.9	J	3.6	J	1.7		1.8	J
Thallium	mg/kg	NC	NC	NC	NC	1.6	UJ	1.2	UJ	1	UJ	1.5	UJ	0.68	U	1.9	J
Vanadium	mg/kg	NC	NC	NC	NC	33.4	J	23.2	J	37.1	J	39.4	J	17.9		39.5	J
Zinc	mg/kg	120	820	150	410	659	J	501	J	7720	J	836	J	378		753	J
Other																	
Total Organic Carbon	mg/kg	NC	NC	NC	NC	66400		66000		32500		62500		34100		43000	
Sediment Particle Size >0.0625	%dryw	NC	NC	NC	NC	17.2		52.8		39.3		13.1		83		16.9	
Sediment Particle Size 0.0039	%dryw	NC	NC	NC	NC	76.5		41.9		56.7		70.1		12.9		72.3	
Sediment Particle Size <0.0039	%dryw	NC	NC	NC	NC	6.3		5.3		4		16.8		4.1		10.6	

NC=No criteria;NA=Not Analyzed;U/UJ=Below detect. limit;XJ/J=Est.concen.;JN= Presump.evidence for compound;R=Rejected data; Note: SEL normalized to station specific TOC
Bold= >LEL
Bold/Shaded= >SEL

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TABLE 10.1
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
Sediment Concentrations Compared to Ecological Screening Values for Back Channel Stations (1996)

Sample ID Date Sampled	Units	Canadian LEL	Canadian SEL	ER-L	ER-M	RCSSD2901 11/25/96	Q	RCSSD3101 12/5/96	Q	RCSSD3201 12/5/96	Q	RCSSD4701 12/5/96	Q
Semivolatile Organic Compounds													
Phenol	ug/kg	NC	NC	NC	NC	69	J	890	UJ	730	UJ	730	UJ
4-Methylphenol	ug/kg	NC	NC	NC	NC	100	J	890	UJ	730	UJ	200	J
Di-n-butylphthalate	ug/kg	NC	NC	NC	NC	670	UJ	890	UJ	730	UJ	730	UJ
Butylbenzylphthalate	ug/kg	NC	NC	NC	NC	670	UJ	890	UJ	730	UJ	730	UJ
Di-n-octylphthalate	ug/kg	NC	NC	NC	NC	670	UJ	890	UJ	730	UJ	730	UJ
bis(2-Ethylhexyl)phthalate	ug/kg	NC	NC	NC	NC	1000	J	460	J	550	J	690	J
Naphthalene	ug/kg	NC	NC	160	2100	77	J	890	UJ	730	UJ	92	J
2-Methylnaphthalene	ug/kg	NC	NC	70	670	47	J	890	UJ	730	UJ	730	UJ
Pyrene	ug/kg	490	24905 - 60265	665	2600	**640**	J	890	UJ	400	J	**620**	J
Dibenzofuran	ug/kg	NC	NC	NC	NC	670	UJ	890	UJ	730	UJ	730	UJ
Benzo(g,h,i)perylene	ug/kg	170	9376 - 22688	NC	NC	150	J	**200**	J	150	J	**250**	J
Indeno(1,2,3-cd)pyrene	ug/kg	200	9377 - 22688	NC	NC	**240**	J	**280**	J	180	J	**360**	J
Benzo(b)fluoranthene	ug/kg	NC	NC	NC	NC	400	J	580	XJ	480	XJ	670	XJ
Fluoranthene	ug/kg	750	29886 - 72318	600	5100	640	J	490	J	440	J	650	J
Benzo(k)fluoranthene	ug/kg	240	43550 - 95006	NC	NC	**460**	J	**460**	XJ	**380**	XJ	**690**	XJ
Acenaphthylene	ug/kg	NC	NC	NC	NC	670	UJ	890	UJ	730	UJ	730	UJ
Chrysene	ug/kg	340	13478 - 32614	384	2800	**450**	J	310	J	260	J	**410**	J
Benzo(a)pyrene	ug/kg	370	42192 - 102096	400	2500	**380**	J	330	J	280	J	**410**	J
Dibenzo(a,h)anthracene	ug/kg	60	4225 - 9217	63.4	260	670	UJ	**170**	J	730	UJ	**180**	J
Benzo(a)anthracene	ug/kg	320	43364 - 104932	261	1600	**340**	J	320	J	270	J	**380**	J
Acenaphthene	ug/kg	NC	NC	16	500	670	UJ	890	UJ	730	UJ	730	UJ
Diethylphthalate	ug/kg	NC	NC	NC	NC	670	UJ	890	UJ	730	UJ	730	UJ
Fluorene	ug/kg	190	5200 - 11344	19	540	670	UJ	890	UJ	730	UJ	730	UJ
Phenanthrene	ug/kg	560	27835 - 67355	240	1500	250	J	160	J	130	J	320	J
Anthracene	ug/kg	220	12025 - 26233	85	1100	70	J	890	UJ	730	UJ	94	J
Carbazole	ug/kg	NC	NC	NC	NC	670	UJ	890	UJ	730	UJ	730	UJ
Pesticides													
alpha-BHC	ug/kg	0.006	598	NC	NC	3.5	UJ	4.6	UJ	3.8	UJ	1.7	J
gamma-BHC (Lindane)	ug/kg	0.003	47.3	NC	NC	**0.46**	J	4.6	UJ	3.8	UJ	3.8	UJ
alpha-Chlordane	ug/kg	0.007	195 - 393.6	NC	NC	**3.3**	J	0.77	R	3.8	UJ	3.8	UJ
gamma-Chlordane	ug/kg	0.007	258 - 425.4	NC	NC	3.5	UJ	4.6	UJ	3.8	UJ	**0.98**	J
4,4'-DDT	ug/kg	0.008	3152.4 - 5033.9	1.5	46.1	**5.6**	J	8.9	UJ	7.3	UJ	5.4	J
4,4'-DDD	ug/kg	0.008	195 - 425.4	0.0022	0.027	**5.8**	J	8.9	UJ	7.3	UJ	7.3	UJ
4,4'-DDE	ug/kg	0.005	617.5 - 1347.1	0.0022	0.027	**14**	J	**6.9**	J	9.1	J	**12**	J
Dieldrin	ug/kg	0.002	3913	NC	NC	6.7	UJ	8.9	UJ	7.3	UJ	7.3	UJ
Endrin	ug/kg	0.003	393.61 - 8580	NC	NC	**6.5**	J	8.9	UJ	7.3	UJ	7.3	UJ
Endrin aldehyde	ug/kg	0.003	4433 - 8528	NC	NC	**28**	J	8.9	UJ	7.3	UJ	7.3	UJ
Heptachlor	ug/kg	NC	NC	NC	NC	3.5	UJ	0.7	R	1.2	J	3.6	UJ
Endosulfan sulfate	ug/kg	NC	NC	NC	NC	6.7	UJ	1.8	R	7.3	UJ	7.3	UJ

NC=No criteria;NA=Not Analyzed;U/UJ=Below detect. limit;XJ/J=Est.concen.;JN= Presump.evidence for compound;R=Rejected data; Note: SEL normalized to station specific TOC
Bold= >LEL
Bold/Shaded= >SEL

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TABLE 10.1
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
Sediment Concentrations Compared to Ecological Screening Values for Back Channel Stations (1996)

Sample ID Date Sampled	Units	Canadian LEL	Canadian SEL	ER-L	ER-M	RCSSD2901 11/25/96	Q	RCSSD3101 12/5/96	Q	RCSSD3201 12/5/96	Q	RCSSD4701 12/5/96	Q
PCBs													
Aroclor-1254	ug/kg	0.06	1105 - 2410.6	NC	NC	67	UJ	**64**	JN	**59**	J	110	JN
Metals													
Aluminum	mg/kg	NC	NC	NC	NC	15800	J	13900	J	12900	J	13333	J
Calcium	mg/kg	NC	NC	NC	NC	2560	J	3040	J	2270	J	2700	J
Iron	mg/kg	20000	40000	NC	NC	**56600**	J	**37500**	J	**33300**	J	**46200**	J
Magnesium	mg/kg	NC	NC	NC	NC	3750	J	3350	J	3070	J	3290	J
Potassium	mg/kg	NC	NC	NC	NC	1950	J	1470	J	1350	J	1410	J
Sodium	mg/kg	NC	NC	NC	NC	65.7	J	104	J	84.6	J	66.9	J
Barium	mg/kg	NC	NC	NC	NC	132	J	148	J	120	J	125	J
Manganese	mg/kg	460	1100	NC	NC	**645**	J	**667**	J	**540**	J	**552**	J
Antimony	mg/kg	NC	NC	2	25	20.9	UJ	9.1	UJ	6.9	UJ	6.6	UJ
Arsenic	mg/kg	6	33	8.2	70	**6.8**	J	**11**	J	**8.5**	J	**9.4**	J
Beryllium	mg/kg	NC	NC	NC	NC	2.1	J	1.9	J	1.8	J	2.4	J
Cadmium	mg/kg	0.6	10	1.2	9.6	**4.1**	J	5.5	R	5	R	4.6	R
Chromium	mg/kg	26	110	81	370	**57.5**	J	**41.1**	J	**40.2**	J	**47**	J
Cobalt	mg/kg	NC	NC	NC	NC	17.1	J	18.5	J	15.7	J	16.2	J
Copper	mg/kg	16	110	34	270	**105**	J	**89.6**	J	**76.2**	J	**103**	J
Lead	mg/kg	31	250	46.7	218	**127**	J	**106**	J	**90.1**	J	**160**	J
Mercury	mg/kg	0.2	2	0.15	0.71	**0.23**	J	**0.26**	UJ	**0.22**	UJ	**0.21**	J
Nickel	mg/kg	16	75	20.9	51.6	**38.2**	J	**33.7**	J	**30.8**	J	**32.7**	J
Selenium	mg/kg	NC	NC	NC	NC	0.49	J	2.3	UJ	3.2	J	2.3	J
Silver	mg/kg	NC	NC	1	3.7	1.3	UJ	2.1	UJ	2.1	J	1.5	UJ
Thallium	mg/kg	NC	NC	NC	NC	5.1	R	3	UJ	2.3	UJ	2.2	UJ
Vanadium	mg/kg	NC	NC	NC	NC	36.7	J	32.3	J	28	J	31	J
Zinc	mg/kg	120	820	150	410	**642**	J	**792**	J	**680**	J	**653**	J
Other													
Total Organic Carbon	mg/kg	NC	NC	NC	NC	47300		57400		41600		59800	
Sediment Particle Size >0.0625	%dryw	NC	NC	NC	NC	34.4		29.6		36.3		41.1	
Sediment Particle Size 0.0039	%dryw	NC	NC	NC	NC	57.7		65.2		57.8		50.5	
Sediment Particle Size <0.0039	%dryw	NC	NC	NC	NC	7.9		5.2		5.9		8.4	

NC=No criteria;NA=Not Analyzed;U/UJ=Below detect. limit;XJ/J=Est.concen.;JN= Presump.evidence for compound;R=Rejected data; Note: SEL normalized to station specific TOC
Bold= >LEL
Bold/Shaded= >SEL

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TABLE 10.2
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
Sediment Concentrations Compared to Ecological Screening Values for Crafts Creek Channel Stations (1996)
(Page 1 of 2)

Sample ID Date Sampled	Units	Canadian LEL	Canadian SEL	ER-L	ER-M	Reference RCDSD4401 35401	Q	Reference RCSSD4401 35401	Q	Reference RCSSD4201 12/2/96	Q	RCDSD4001 12/4/96	Q	RCSSD3001 11/25/96	Q	RCSSD3501 12/3/96	Q	RCSSD4001 12/4/96	Q
Semivolatile Organic Compounds																			
4-Methylphenol	ug/kg	NC	NC	NC	NC	510	U	520	U	410	U	1600	UJ	66	J	1200	UJ	1600	UJ
Butylbenzylphthalate	ug/kg	NC	NC	NC	NC	510	U	520	U	410	U	1600	UJ	690	UJ	400	J	1600	UJ
bis(2-Ethylhexyl)phthalate	ug/kg	NC	NC	NC	NC	510	U	520	U	410	U	370	J	490	J	740	J	550	J
Naphthalene	ug/kg	NC	NC	160	2100	510	U	520	U	410	U	1600	UJ	59	J	1200	UJ	1600	UJ
2-Methylnaphthalene	ug/kg	NC	NC	NC	NC	510	U	520	U	410	U	1600	UJ	40	J	1200	UJ	1600	UJ
Acenaphthene	ug/kg	NC	NC	16	500	510	U	520	U	410	U	1600	UJ	38	J	1200	UJ	1600	UJ
Fluorene	ug/kg	190	7056	19	540	510	U	520	U	410	U	1600	UJ	81	J	1200	UJ	1600	UJ
Phenanthrene	ug/kg	560	8578.5 - 96900	240	1500	510	U	260	J	220	J	250	J	500	J	320	J	190	J
Anthracene	ug/kg	220	16317	85	1100	510	U	520	U	410	U	1600	UJ	120	J	1200	UJ	1600	UJ
Pyrene	ug/kg	490	7676 - 86700	665	2600	65	J	240	J	290	J	500	J	860	J	750	J	360	J
Dibenzofuran	ug/kg	NC	NC	NC	NC	510	U	520	U	410	U	1600	UJ	48	J	1200	UJ	1600	UJ
Benzo(g,h,i)perylene	ug/kg	170	2889.6 - 32640	NC	NC	510	U	520	U	90	J	170	J	180	J	230	J	1600	U
Indeno(1,2,3-cd)pyrene	ug/kg	200	2889.6 - 32640	NC	NC	510	U	520	U	89	J	170	J	260	J	260	J	1600	U
Benzo(b)fluoranthene	ug/kg	NC	NC	NC	NC	56	XJ	97	XJ	220	XJ	470	XJ	400	J	880	J	360	XJ
Fluoranthene	ug/kg	750	9210.6 - 104040	600	5100	61	J	180	J	290	J	500	J	1100	J	900	J	380	J
Benzo(k)fluoranthene	ug/kg	240	12100.2 - 136680	NC	NC	53	XJ	93	XJ	210	XJ	400	XJ	440	J	740	J	300	XJ
Chrysene	ug/kg	340	4153.8 - 46920	384	2800	510	U	110	J	160	J	310	J	520	J	530	J	260	J
Benzo(a)pyrene	ug/kg	370	13003.2 - 146880	400	2500	510	U	79	J	150	J	270	J	440	J	450	J	220	J
Benzo(a)anthracene	ug/kg	320	13364.4 - 150960	261	1600	510	U	86	J	150	J	280	J	430	J	510	J	200	J
Pesticides																			
Aldrin	ug/kg	0.002	616	NC	NC	2.8	U	2.8	U	2.2	U	8.4	UJ	3.5	UJ	1	J	8.4	UJ
alpha-Chlordane	ug/kg	0.007	264.6	NC	NC	2.8	U	2.8	U	2.2	U	8.4	UJ	2.1	J	6.2	UJ	8.4	UJ
gamma-Chlordane	ug/kg	0.007	612	NC	NC	2.8	U	2.8	U	2.2	U	8.4	UJ	3.5	UJ	1.4	J	8.4	UJ
Dieldrin	ug/kg	0.002	6106.1 - 7352.8	NC	NC	5.5	U	5.5	U	4.3	U	2.4	J	6.9	UJ	12	UJ	2.1	J
Methoxychlor	ug/kg	NC	NC	NC	NC	28	U	28	U	22	U	84	UJ	35	UJ	6.3	J	84	UJ
4,4'-DDE	ug/kg	0.005	399 - 1535.2	0.0022	0.027	4.5	J	3.4	J	4.3	U	16	UJ	6.9	UJ	12	UJ	4.7	J
Endrin aldehyde	ug/kg	0.003	5733	NC	NC	5.5	U	5.5	U	2.2	U	16	UJ	17	J	12	UJ	16	UJ
Heptachlor	ug/kg	NC	NC	NC	NC	2.8	U	2.8	U	2.2	U	1.2	J	3.5	UJ	6.2	UJ	1.1	J
PCBs																			
Aroclor-1254	ug/kg	0.06	307.02 - 3468	NC	NC	23	JN	32	J	17	J	160	UJ	69	UJ	190	N	160	UJ
Aroclor-1260	ug/kg	0.005	1610.4 - 1939.2	NC	NC	55	U	55	U	43	U	89	J	69	UJ	120	UJ	77	J
Metals																			
Aluminum	mg/kg	NC	NC	NC	NC	7930		7260		3830		19700	J	13700	J	16600	J	24300	J
Calcium	mg/kg	NC	NC	NC	NC	1350		1620		634		2910	J	1920	J	2730	J	3040	J
Iron	mg/kg	20000	40000	NC	NC	54700		54900		21100		71100	J	41100	J	62100	J	77100	J
Magnesium	mg/kg	NC	NC	NC	NC	1730		1550		664		2970	J	2860	J	3260	J	3550	J
Potassium	mg/kg	NC	NC	NC	NC	3700		3110		1030		2940	J	2170	J	2160	J	4060	J

NC=No criteria;NA=Not Analyzed;U/UJ=Below detect. limit;XJ/J=Est.concen.;JN=Presump.evidence for compound; R=Rejected data; Note: SEL normalized to station specific TOC
Bold= >LEL
Bold/Shaded= >SEL

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TABLE 10.2
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
Sediment Concentrations Compared to Ecological Screening Values for Crafts Creek Channel Stations (1996)
(Page 2 of 2)

Sample ID Date Sampled	Units	Canadian LEL	Canadian SEL	ER-L	ER-M	Reference RCDSD4401 35401	Q	Reference RCSSD4401 35401	Q	Reference RCSSD4201 12/2/96	Q	RCDSD4001 12/4/96	Q	RCSSD3001 11/25/96	Q	RCSSD3501 12/3/96	Q	RCSSD4001 12/4/96	Q
Sodium	mg/kg	NC	NC	NC	NC	40.2		40.6		49.1		213	J	83.5	J	148	J	191	J
Barium	mg/kg	NC	NC	NC	NC	47.3		52.7		19.8		161	J	118	J	173	J	172	J
Manganese	mg/kg	460	1100	NC	NC	233		259		92.5		513	J	873	J	749	J	516	J
Arsenic	mg/kg	6	33	8.2	70	14	J	15.2	J	10.1	J	22.1	J	10.7	J	17.8	J	23.7	J
Beryllium	mg/kg	NC	NC	NC	NC	1.2		1.3		0.99		3.3	J	1.6	J	2.4	J	3.3	J
Cadmium	mg/kg	0.6	10	1.2	9.6	1	U	0.34	U	0.26	U	2	J	3.3	J	3.7	J	2.6	J
Chromium	mg/kg	26	110	81	370	34.7		33		20.5		55.7	J	48.2	J	59.8	J	64.2	J
Cobalt	mg/kg	NC	NC	NC	NC	6		6.7		4.2		23.5	J	16.9	J	26.6	J	25.4	J
Copper	mg/kg	16	110	34	270	3.1		4.6		13.2	J	**158**	J	**297**	J	**434**	J	**160**	J
Lead	mg/kg	31	250	46.7	218	17.3		18.3		15.1		230	J	**278**	J	**521**	J	225	J
Mercury	mg/kg	0.2	2	0.15	0.71	0.04	U	0.16	U	0.13	U	0.43	UJ	0.15	J	0.34	J	0.43	UJ
Nickel	mg/kg	16	75	20.9	51.6	10.1		14		5.2		43.5	J	31	J	42	J	45.8	J
Selenium	mg/kg	NC	NC	NC	NC	1.4	J	2.4	J	1	U	3.8	J	0.53	J	3	J	3.5	UJ
Thallium	mg/kg	NC	NC	NC	NC	10	U	1.7	U	1.3	U	4.4	UJ	1.6	J	3.3	UJ	4.5	UJ
Vanadium	mg/kg	NC	NC	NC	NC	39.5		38.8		34.8		73.4	J	40.4	J	47.3	J	82.2	J
Zinc	mg/kg	120	820	150	410	77.5		80.6		61.9		522	J	653	J	**827**	J	539	J
Other																			
Sediment Particle Size >0.0625	%dryw	NC	NC	NC	NC	82.4		81.4		85.4		22.9		50.9		33		15	
Sediment Particle Size 0.0039-	%dryw	NC	NC	NC	NC	12.1		12.2		9.7		64.8		38.3		56.7		77.4	
Sediment Particle Size <0.0039	%dryw	NC	NC	NC	NC	5.5		6.4		4.9		12.4		10.8		10.3		7.6	
Total Organic Carbon	mg/kg	NC	NC	NC	NC	21000		23300		9030		67100		44100		102000		60800	

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NC=No criteria;NA=Not Analyzed;U/UJ=Below detect. limit;XJ/J=Est.concen.;JN=Presump.evidence for compound; R=Rejected data; Note: SEL normalized to station specific TOC
Bold= >LEL
Bold/Shaded= >SEL

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TABLE 10.3
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
Sediment Concentrations Compared to Ecological Screening Values for Crafts Creek Wetland Stations (1996)
(Page 1 of 2)

Sample ID / Date Sampled	Units	Canadian LEL	Canadian SEL	ER-L	ER-M	Reference RCSSD4101 12/4/96	Q	RCSSD3401 12/3/96	Q	RCSSD3601 12/3/96	Q	RCSSD3701 12/3/96	Q	RCSSD3801 12/4/96	Q	RCSSD3901 12/3/96	Q
Semivolatile Organic Compounds																	
2-Methylphenol	ug/kg	NC	NC	NC	NC	1200	UJ	380	UJ	190	J	1900	UJ	1200	UJ	1600	UJ
4-Methylphenol	ug/kg	NC	NC	NC	NC	1200	UJ	76	J	1500	UJ	1900	UJ	1200	UJ	1600	UJ
Butylbenzylphthalate	ug/kg	NC	NC	NC	NC	1200	UJ	50	J	1500	U	1900	UJ	360	UJ	1600	UJ
Di-n-octylphthalate	ug/kg	NC	NC	NC	NC	1200	UJ	380	UJ	1500	UJ	1900	UJ	81	J	1600	UJ
bis(2-Ethylhexyl)phthalate	ug/kg	NC	NC	NC	NC	1200	UJ	130	J	410	J	360	J	2500	J	670	J
Pyrene	ug/kg	490	51850 - 102850	665	2600	1200	UJ	210	J	550	J	440	J	2000	J	830	J
Benzo(g,h,i)perylene	ug/kg	170	21439 - 38720	NC	NC	1200	UJ	96	J	250	J	1900	UJ	490	J	220	J
Indeno(1,2,3-cd)pyrene	ug/kg	200	21440 - 38720	NC	NC	1200	UJ	130	J	280	J	1900	UJ	490	J	240	J
Benzo(b)fluoranthene	ug/kg	NC	NC	NC	NC	1200	UJ	300	XJ	630	XJ	480	XJ	1600	XJ	740	J
Fluoranthene	ug/kg	750	62220 - 123420	600	5100	1200	UJ	230	J	610	J	450	J	2300	J	850	J
Benzo(k)fluoranthene	ug/kg	NC	NC	NC	NC	1200	UJ	310	XJ	650	XJ	400	XJ	1400	XJ	630	J
Chrysene	ug/kg	340	28060 - 55660	384	2800	1200	UJ	190	J	410	J	340	J	1200	J	540	J
Benzo(a)pyrene	ug/kg	370	87840 - 174240	400	2500	1200	UJ	160	J	350	J	270	J	1000	J	460	J
Dibenzo(a,h)anthracene	ug/kg	60	8710 - 15730	NC	NC	1200	UJ	56	J	310	J	1900	UJ	120	J	1600	UJ
Benzo(a)anthracene	ug/kg	320	90280 - 179080	261	1600	1200	UJ	140	J	270	J	250	J	1100	J	430	J
Phenanthrene	ug/kg	560	57950 - 114950	240	1500	1200	UJ	87	J	270	J	200	J	1400	J	470	J
Anthracene	ug/kg	220	44770	85	1100	1200	UJ	380	UJ	1500	UJ	1900	UJ	300	J	1600	UJ
Pesticides																	
Aldrin	ug/kg	NC	NC	NC	NC	6.2	UJ	2	U	7.7	UJ	10	UJ	6.4	UJ	1.5	J
gamma-Chlordane	ug/kg	0.007	534.6	NC	NC	6.2	UJ	2	U	7.7	UJ	10	UJ	6.4	UJ	4.4	J
4,4'-DDE	ug/kg	0.005	1159 - 2299	0.0022	0.027	3.6	J	1.9	J	4.4	J	5.9	J	9.8	J	16	UJ
Heptachlor	ug/kg	NC	NC	NC	NC	6.2	UJ	0.26	J	7.7	UJ	10	UJ	6.4	UJ	2.6	J
PCBs																	
Aroclor-1254	ug/kg	0.06	2074 - 3029	NC	NC	120	UJ	24	JN	81	JN	89	N	120	UJ	140	J
Aroclor-1260	ug/kg	0.005	2904	NC	NC	120	UJ	38	U	150	UJ	190	UJ	48	J	160	UJ
Metals																	
Aluminum	mg/kg	NC	NC	NC	NC	21100	J	17000	J	20600	J	16400	J	13400	J	17900	J
Calcium	mg/kg	NC	NC	NC	NC	2330	J	2770	J	2850	J	2400	J	3170	J	2550	J
Iron	mg/kg	20000	40000	NC	NC	67700	J	61200	J	54900	J	50900	J	42300	J	53900	J
Magnesium	mg/kg	NC	NC	NC	NC	2880	J	3420	J	3680	J	2790	J	2170	J	2680	J
Potassium	mg/kg	NC	NC	NC	NC	3440	J	2120	J	2670	J	2010	J	2000	J	2820	J
Sodium	mg/kg	NC	NC	NC	NC	176	J	139	J	155	J	188	J	184	J	183	J
Barium	mg/kg	NC	NC	NC	NC	142	J	157	J	172	J	146	J	131	J	143	J
Manganese	mg/kg	460	1100	NC	NC	357	J	480	J	634	J	359	J	272	J	269	J
Arsenic	mg/kg	6	33	8.2	70	27.1	J	13.4	J	20.2	J	16	J	17.2	J	20	J
Beryllium	mg/kg	NC	NC	NC	NC	2.7	J	2.6	J	3	J	2.3	J	1.6	J	2.8	J
Cadmium	mg/kg	0.6	10	1.2	9.6	2	J	3.9	J	4	J	3.3	J	3.6	J	3.1	J

NC=No criteria;NA=Not Analyzed;U/UJ=Below detect. limit;XJ/J=Est.concen.;JN=Presump.evidence for compound; R=Rejected data; Note: SEL normalized to station specific TOC
Bold= >LEL
Bold/Shaded= >SEL

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TABLE 10.3
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
Sediment Concentrations Compared to Ecological Screening Values for Crafts Creek Wetland Stations (1996)
(Page 2 of 2)

Sample ID Date Sampled	Units	Canadian LEL	Canadian SEL	ER-L	ER-M	Reference RCSSD4101 12/4/96	Q	RCSSD3401 12/3/96	Q	RCSSD3501 12/3/96	Q	RCSSD3701 12/3/96	Q	RCSSD3801 12/4/96	Q	RCSSD3901 12/3/96	Q
Chromium	mg/kg	26	110	81	370	**51.6**	J	**54.6**	J	**59.6**	J	**51.1**	J	**41.1**	J	**51.8**	J
Cobalt	mg/kg	NC	NC	NC	NC	28.4	J	20.2	J	27.3	J	23.8	J	32.4	J	24.1	J
Copper	mg/kg	16	110	34	270	**31.4**	J	**251**	J	**252**	J	**282**	J	**88.7**	J	**109**	J
Lead	mg/kg	31	250	46.7	218	**78.6**	J	**346**	J	**345**	J	**381**	J	**190**	J	**203**	J
Nickel	mg/kg	16	75	20.9	51.6	**45.5**	J	**41.5**	J	**44.3**	J	**39.4**	J	**52.8**	J	**45.7**	J
Selenium	mg/kg	NC	NC	NC	NC	2	U	4.2	J	5.2	J	4.1	J	3.1	J	3.7	J
Vanadium	mg/kg	NC	NC	NC	NC	91.5	J	50.2	J	63.4	J	52.2	J	56.3	J	68.6	J
Zinc	mg/kg	120	820	150	410	**452**	J	**793**	J	**799**	J	**687**	J	**774**	J	**737**	J
Other																	
Sediment Particle Size >0.0625	%dryw	NC	NC	NC	NC	9.9		9.9		10.5		11.3		15.1		18.8	
Sediment Particle Size 0.0039-	%dryw	NC	NC	NC	NC	82.6		85.1		83.7		80.2		75.6		72.7	
Sediment Particle Size <0.0039	%dryw	NC	NC	NC	NC	7.5		5.1		5.8		8.5		9.3		8.5	
Total Organic Carbon	mg/kg	NC	NC	NC	NC	71100		74500		67000		61000		121000		89100	

NC=No criteria;NA=Not Analyzed;U/UJ=Below detect. limit;XJ/J=Est.concen.;JN=Presump.evidence for compound; R=Rejected data; Note: SEL normalized to station specific TOC
Bold= >LEL
Bold/Shaded= >SEL

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TABLE 11.1
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
Sediment Concentrations Compared to Ecological Screening Values for Back Channel Stations (1998)
(Page 1 of 2)

Sample ID Date	Units	Canadian LEL	Canadian SEL	ER-L	ER-M	Reference RCSSD4301 Q 11/27/96	Reference RCSSD4501 Q 11/27/96	Reference RCSSD4601 Q 11/27/96	SD48-01 Q	SD49-01 Q	SD50-01 Q	SD51-01 Q	SD52-01 Q
Metals													
Aluminum	mg/kg	NC	NC	NC	NC	4670	12000	20300 J	26900 J	38300 J	38200 J	1760	30800 J
Calcium	mg/kg	NC	NC	NC	NC	828	3020	5990 J	2650 J	2650 J	2590 J	3288 U	2940 J
Iron	mg/kg	20000	40000	NC	NC	15800	26500	34400 J	88400 J	56600 J	65600 J	587000	103000 J
Magnesium	mg/kg	NC	NC	NC	NC	1820	3680	4810 J	4140 J	6380 J	5350 J	3288 U	4650 J
Potassium	mg/kg	NC	NC	NC	NC	648	1550	2380 J	5420 J	7330 J	7420 J	658 U	6380 J
Barium	mg/kg	NC	NC	NC	NC	32.5	114	174 J	158 J	227 J	211 J	26 U	213 J
Manganese	mg/kg	460	1100	NC	NC	201	580	1100 J	550 J	665 J	630 J	4460	1350 J
Arsenic	mg/kg	6	33	8.2	70	2	6	8.2 J	10 J	10.7 J	11.2 J	104	16.5 J
Beryllium	mg/kg	NC	NC	NC	NC	0.47	1.5	2.4 J	1.9 J	2.2 J	2.7 J	0.7 U	2.1 J
Cadmium	mg/kg	0.6	10	1.2	9.6	0.57 U	3.4	7.1 J	3.89 J	5.25 J	5.06 J	0.05 J	3.1 J
Chromium	mg/kg	26	110	81	370	11.4	29.7	46.2 J	62 J	77 J	76 J	365	101 J
Cobalt	mg/kg	NC	NC	NC	NC	7.5	14.8	24.3 J	16 J	22 J	21 J	39	23 J
Copper	mg/kg	16	110	34	270	14.9 J	42 J	76.6 J	93 J	100 J	136 J	632	147 J
Lead	mg/kg	31	250	46.7	218	33.3	56.8	63.6 J	131 J	150 J	156 J	100	158 J
Mercury	mg/kg	0.2	2	0.15	0.71	0.06 U	0.18	0.29 J	0.27 U	0.27 U	0.27 U	0.13 U	0.22 U
Nickel	mg/kg	16	75	20.9	51.6	15.9	29.2	34.3 J	34 J	42 J	41 J	238	57 J
Vanadium	mg/kg	NC	NC	NC	NC	8.7	24.4	37.1 J	58 J	74 J	72 J	70	70 J
Zinc	mg/kg	120	820	150	410	182	518	903 J	626 J	771 J	780 J	113	696 J
Other													
moisture	%	NC	NC	NC	NC				63	62.7	63.6	24	55.5
Sediment Particle Size >0.0625	%dryw	NC	NC	NC	NC	97.5	56.2	17.8	53.1	21.9	26	93.1	45.1
Sediment Particle Size 0.0039-	%dryw	NC	NC	NC	NC	1.9	34.7	74.5	42.8	65.9	60.5	3.4	45.1
Sediment Particle Size <0.0039	%dryw	NC	NC	NC	NC	0.6	9.1	7.7	4.1	12.2	13.5	3.5	10.8
Total Organic Carbon	mg/kg	NC	NC	NC	NC	29300	65600	60300	52200	43900	38200	7160	50300

NC=No criteria; U=Below detect. limit; J=Est.concen.
Bold= >LEL
Bold/Shaded= >SEL

TABLE 11.1
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
Sediment Concentrations Compared to Ecological Screening Values for Back Channel Stations (1998)
(Page 2 of 2)

Sample ID Date	Units	Canadian LEL	Canadian SEL	ER-L	ER-M	SD53-01	Q	SD54-01	Q	SD55-01	Q	SD55-01D	Q
Metals													
Aluminum	mg/kg	NC	NC	NC	NC	32600	J	21800	J	32200	J	30200	J
Calcium	mg/kg	NC	NC	NC	NC	3430	J	3070	J	2960	J	2480	J
Iron	mg/kg	20000	40000	NC	NC	**50400**	J	**61900**	J	**60500**	J	**61900**	J
Magnesium	mg/kg	NC	NC	NC	NC	5120	J	3720	J	4810	J	4400	J
Potassium	mg/kg	NC	NC	NC	NC	6610	J	4720	J	6670	J	5950	J
Barium	mg/kg	NC	NC	NC	NC	224	J	160	J	184	J	164	J
Manganese	mg/kg	460	1100	NC	NC	**921**	J	**1210**	J	**740**	J	**628**	J
Arsenic	mg/kg	6	33	8.2	70	**9.8**	J	**11.8**	J	**11**	J	**8.4**	J
Beryllium	mg/kg	NC	NC	NC	NC	1.9	J	1.3	J	3.8	J	2.6	J
Cadmium	mg/kg	0.6	10	1.2	9.6	**4.01**	J	**2.2**	J	**4.66**	J	**4.58**	J
Chromium	mg/kg	26	110	81	370	**64**	J	**79**	J	**87**	J	**68**	J
Cobalt	mg/kg	NC	NC	NC	NC	20	J	18	J	18	J	18	J
Copper	mg/kg	16	110	34	270	**113**	J	**179**	J	**143**	J	**97**	J
Lead	mg/kg	31	250	46.7	218	**128**	J	**110**	J	**233**	J	**160**	J
Mercury	mg/kg	0.2	2	0.15	0.71	0.28	U	0.21	U	**1.04**	J	**0.27**	U
Nickel	mg/kg	16	75	20.9	51.6	**37**	J	**37**	J	**47**	J	**36**	J
Vanadium	mg/kg	NC	NC	NC	NC	66	J	56	J	68	J	58	J
Zinc	mg/kg	120	820	150	410	**723**	J	**835**	J	**783**	J	**678**	J
Other													
moisture	%	NC	NC	NC	NC	64.6		51.7		63.5		63.3	
Sediment Particle Size >0.0625	%dryw	NC	NC	NC	NC	27.2		56.2		31.9		32.2	
Sediment Particle Size 0.0039-	%dryw	NC	NC	NC	NC	64.7		39.9		63.8		61.4	
Sediment Particle Size <0.0039	%dryw	NC	NC	NC	NC	8.1		3.8		4.3		6.5	
Total Organic Carbon	mg/kg	NC	NC	NC	NC	46100		39800		45000		39000	

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NC=No criteria; U=Below detect. limit; J=Est.concen.
Bold= >LEL
Bold/Shaded= >SEL

TABLE 11.2
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
Sediment Concentrations Compared to Ecological Screening Values for Back Channel Stations
Depth 1 to 2 feet (1998)

Sample ID	Units	Canadian LEL	Canadian SEL	ER-L	ER-M	Reference RCSSD4301 11/27/96	Q	Reference RCSSD4501 11/27/96	Q	Reference RCSSD4601 11/27/96	Q	SD25-02	Q	SD-26-02	Q	SD27-02	Q
Metals																	
Aluminum	mg/kg	NC	NC	NC	NC	4670		12000		20300	J	27200		24600		8090	
Calcium	mg/kg	NC	NC	NC	NC	828		3020		5990	J	1860		1580		1110	
Iron	mg/kg	20000	40000	NC	NC	15800		**26500**		**34400**	J	**209000**		**326000**		**502000**	
Magnesium	mg/kg	NC	NC	NC	NC	1820		3680		4810	J	3260		2620		1340	
Potassium	mg/kg	NC	NC	NC	NC	648		1550		2380	J	4680		3920		1290	J
Barium	mg/kg	NC	NC	NC	NC	32.5		114		174	J	166		135		55	
Manganese	mg/kg	460	1100	NC	NC	201		**580**		**1190**	J	**1830**		**2700**		**4130**	
Arsenic	mg/kg	6	33	8.2	70	2		6		**8.2**	J	**26.5**		**42.1**		**63.8**	
Beryllium	mg/kg	NC	NC	NC	NC	0.47		1.5		2.4	J	6		4.4		2	
Cadmium	mg/kg	0.6	10	1.2	9.6	0.57	U	**3.4**		**7.1**	J	**3.26**	J	**2.53**	J	**0.94**	J
Chromium	mg/kg	26	110	81	370	11.4		**29.7**		**46.2**	J	**179**		**224**		**305**	
Cobalt	mg/kg	NC	NC	NC	NC	7.5		14.8		24.3	J	25		32		41	
Copper	mg/kg	16	110	34	270	14.9	J	**42**	J	**76.6**	J	**853**		**624**		**712**	
Lead	mg/kg	31	250	46.7	218	**33.3**		**56.8**		**83.6**	J	**654**		**1290**		**706**	
Mercury	mg/kg	0.2	2	0.15	0.71	0.06	U	0.18		**0.29**	J	**0.26**		**0.23**		0.16	U
Nickel	mg/kg	16	75	20.9	51.6	15.9		**29.2**		**34.3**	J	**128**		**180**		**270**	
Vanadium	mg/kg	NC	NC	NC	NC	8.7		24.4		37.1	J	70		79		59	
Zinc	mg/kg	120	820	150	410	**182**		**518**		**903**	J	**1070**		**1080**		**917**	
Other																	
% Moisture	%	NC	NC	NC	NC							41.2		42.3		39.3	
Sediment Particle Size >0.0625	%dryw	NC	NC	NC	NC	97.5		56.2		17.8		20.4		38.8		44.3	
Sediment Particle Size 0.0039-	%dryw	NC	NC	NC	NC	1.9		34.7		74.5		63.1		51.4		50.5	
Sediment Particle Size <0.0039	%dryw	NC	NC	NC	NC	0.6		9.1		7.7		16.5		9.8		5.2	
Total Organic Carbon	mg/kg	NC	NC	NC	NC	29300		65600		60300		44600		30300		29400	

NC=No criteria; U=Below detect. limit; J=Est.concen.
Bold= >LEL
Bold/Shaded= >SEL

TABLE 12
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
STATISTICAL SUMMARY FOR 1990 RI GROUNDWATER SAMPLING (2 ROUNDS)

COMPOUND	MINIMUM DETECTED	AVERAGE OF POSITIVE DETECTIONS	MAXIMUM DETECTED ug/L	LOCATION MAXIMUM DETECT	FREQUENCY OF DETECTION	New Jersey GWQS ug/L	Federal MCLs ug/L	Number Exceeding NJ-GWQS	Range Exceeding NJ-GWQS	Number Exceeding MCLs	Range Exceeding MCLs
Volatile Organics											
Chloroform	1	1	1	MW05S	1 / 70	6	100	0/1		0/1	
1,1-Dichloroethane	2	2	2	MW07	2 / 70	50		0/2			
1,1,1-Trichloroethane	2	2	2	MW23	1 / 70	30	200	0/1		0/1	
1,2-Dichloroethane	1	3	6	MW14	4 / 70	2	5	3/4	2-6	1/4	6-6
1,1,2-Trichloroethane	7	8	9	MW01S	2 / 70	3	5	2/2	7-9	2/2	7-9
1,1,2,2-Tetrachloroethane	1	1	1	MW10	1 / 70	1		0/1			
Carbon disulfide	1	1	1	MW28	1 / 70						
Methylene chloride	1	1	2	MW18S	8 / 70	3	5	0/8		0/8	
Total TICS	1	34	161	MW10	38 / 70						
Semi-Volatile Organics											
Di-n-butylphthalate	1	1	1	MW10	1 / 70	900		0/1			
N-Nitrosodiphenylamine	4	4	4	MW10	1 / 70	20		0/1			
bis(2-Ethylhexyl) phthalate	1	12	47	MW25	8 / 70	30	4	1/8	47-47	6/8	6-47
Pyrene	2	2	2	MW01S, MW21	2 / 70	200		0/2			
"Total" Inorganics											
Aluminum	52	6,264	41,800	MW14	70 / 70	200		66/70	230-41800		
Antimony	32	86	168	MW08S	5 / 70	20	5	5/5	32-168	5/5	32-168
Arsenic	2.1	54	1,690	MW08S	54 / 70	8	50	32/54	8-1690	3/54	138-1690
Barium	4.9	337	8,600	MW08S	63 / 70	2000	1000	2/63	4550-8600	4/63	1100-8600
Beryllium	1.2	8	26	MW24D	10 / 70	20	1	1/10	26-26	10/10	1-26
Cadmium	3.1	14	46	MW08S	5 / 70	4	10	3/5	5-46	2/5	14-46
Calcium	4,090	43,770	168,000	MW08S	69 / 70						
Chromium	5.1	69	1,210	MW08S	48 / 70	100		6/48	117-1210		
Cobalt	4.3	32	249	MW12	28 / 70						
Copper	5.3	349	5,690	MW08S	60 / 70	1000	1300	4/60	1170-5690	3/60 -	3520-5690
Iron	1,500	95,806	2,550,000	MW12	70 / 70	300		70/70	1500-2550000		
Lead	2.0	94	875	MW28	54 / 70	10	50	41/54	11-875	18/54	52-875
Magnesium	1,630	15,669	96,400	MW10	69 / 70						
Manganese	13	4,322	191,000	MW08S	70 / 70	50		65/70	52-191000		
Mercury	0.46	0.46	0.46	MW06	1 / 70	2	2	0/1		0/1	
Nickel	5.2	44	465	MW08S	40 / 70	100	100	3/40	151-465	3/40	151-465
Potassium	1,770	6,607	24,900	MW04	70 / 70						
Selenium	3.2	9.2	23	MW17	8 / 70	50	10	0/8		3/8	14-23
Silver	4.0	6.4	7.6	MW08S	6 / 70	2	50	6/6	4-8	0/6	
Sodium	1,910	19,279	181,000	MW25	70 / 70	50000		5/70	53100-181000		
Vanadium	2.3	86	3,060	MW08S	59 / 70						
Zinc	14	986	17,800	MW24D	69 / 70	5000		3/69	6410-17800		
"Dissolved" Inorganics											
Aluminum	12	1,155	6,310	MW06	34 / 70	200		13/34	358-6310		
Antimony	33	41	62	MW24D	8 / 70	20	5	8/8	33-62	8/8	33-62
Arsenic	2.1	6.5	26	MW25	25 / 70	8	50	7/25	8-26	0/25	
Barium	4.2	44	131	MW04	55 / 70	2000	1000	0/55		0/55	
Beryllium	4.0	10	25	MW24D	6 / 70	20	1	1/6	25-25	6/6	4-25
Cadmium	4.2	4.2	4.2	MW21	1 / 70	4	10	1/1	4-4	0/1	
Calcium	977	40,317	131,000	MW10	70 / 70						
Chromium	7.2	10	12	MW26	4 / 70	100		0/4			
Cobalt	4.6	29	128	MW24D	15 / 70						
Copper	9.4	844	5,650	MW21	12 / 70	1000	1300	2/12	4050-5650	2/12	4050-5650
Iron	28	35,837	466,000	MW24D	48 / 70	300		39/48	333-466000		
Lead	1.0	3.2	13.1	MW14	15 / 70	10	50	1/15	13-13	0/15	
Magnesium	653	14,610	97,000	MW10	70 / 70						
Manganese	1.0	1,159	19,000	MW24D	65 / 70	50		48/65	51-19000		
Nickel	5.0	39	215	MW24D	17 / 70	100	100	2/17	150-215	2/17	150-215
Potassium	1,190	6,219	25,000	MW04	70 / 70						
Selenium	2.8	6.8	19	MW17	12 / 70	50	10	0/12		3/12	13-19
Sodium	1,540	21,197	170,000	MW25	70 / 70	50000		6/70	51100-170000		
Vanadium	2.1	20	71	MW29	16 / 70						
Zinc	2.0	888	18,200	MW24D	54 / 70	5000		2/54	16300-18200		

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TABLE 13
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
SUMMARY OF 1990 GROUNDWATER QUALITY PARAMETERS

CONSTITUENT (mg/L)	MINIMUM DETECTED	AVERAGE OF POSITIVE DETECTIONS	MAXIMUM DETECTED	LOCATION MAXIMUM DETECT	FREQUENCY OF DETECTION	Federal MCL (ug/l)	Number Exceeding MCLs	Range Exceeding MCLs
Acidity	21	169.0	870	MW24D	8 / 46			
Alkalinity	4.0	101.2	300	MW08S	26 / 68			
Chloride	4.9	50.3	660	MW24D	20 / 68			
Chemical Oxygen Demand	5.0	59.7	660	MW01S, MW24D	59 / 63			
Fluoride	0.10	0.92	7.80	MW25	30 / 68	4	1/30	7.8/7.8
Nitrate	0.20	0.71	2.90	MW16	10 / 34	10	0/10	
Nitrite (as N)	0.20	0.20	0.20	MW23, MW25	2 / 34	1	0/2	
Oil & Grease	0.40	0.98	2.40	MW09	13 / 46			
Residue, non-filterable	32	436.4	5,800	MW12	33 / 68			
Sulfate	8.0	88.0	490	MW24D	32 / 68	400	1/32	490/490
Total dissolved solids (TDS)	110	318.5	1,500	MW24D	33 / 67			
Total organic carbon	1.0	189.5	16,000	MW27	87 / 64			

TABLE 14
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE — REMEDIAL INVESTIGATION
SUMMARY OF COMPOUNDS DETECTED IN FFS-II GROUNDWATER SAMPLES

			CONCENTRATION RANGE (ug/L)			
	NJ GWQS	Federal MCLs	Background Well (MW-26)		Slag Disposal Area Wells	
Analyte			Total	Dissolved	Total	Dissolved
Volatiles:	mg/l	mg/l				
Methylene Chloride	3	5	-	NA	ND - 1.4	NA
1,1-Dichloro-ethane	2	5	-	NA	ND - 2.0	NA
Chloroform	6	100	5	NA	ND - 1.0	NA
Base Neutral Extractables:						
Bis(2-ethylhexyl) phthalate	30	40	ND - 2.0J	NA	ND - 7.0J	NA
Metals:						
Aluminum	200	-	5,350 – 11,700J	ND - 39J	245J - 15,100	ND – 6,200
Antimony	20	5	ND - 31.9	-	ND -33.2	ND - 37.1
Arsenic	8	50	ND - 3.4J	-	ND - 27.5	ND - 9.4
Barium	2000	1000	ND - 98J	27J - 33.6	42.1 – 4,550*	ND - 131
Beryllium	20	1	ND - 4J	ND - 4J	ND - 7J	ND - 4J
Cadmium	4	10	ND - 4J	-	ND - 5J	-
Calcium	-	-	9,520 – 13,500J	8,750 – 12,800J	12,400J – 86,000J	3960 – 42,000J
Chromium	100	1	31.8 - 55J*	ND -12J	ND - 248J*	-
Cobalt	-	-	ND - 10J	ND - 6J	ND - 23.5	ND - 9.2
Copper	1000	1300	19.8 - 37J	-	ND - 234	ND - 150
Iron	300	-	11,100 – 31,100J	-	11,500 – 98,000	ND – 26,200J
Lead	10	50	11J -27.3J	-	2.8 - 194J*	ND - 3.2J
Magnesium	-	-	ND – 7,400J	4,600J – 4,740J	5,630 – 26,300J	6,230 – 15,800
Manganese	50	-	193 - 326J	64.3 J – 73J	206 – 10,300J	30J - 471
Nickel	100	100	ND - 21J	-	ND - 37J	ND - 25
Potassium	-	-	3,400 – 4,950	2,570 – 2,640	3,080 – 24,900	640 – 25,000
Sodium	50,000	-	12,000 – 12,600	12,200 – 13,500J	2,600 – 26,400	1,610 –21,800
Vanadium	-	-	21.6 - 46J	-	ND - 226J	ND - 71J
Zinc	5000	-	53.7 - 81J	2J - 11.8	25.2 - 310J	ND - 181

- or ND = Not Detected
NA = Not Available
J = Estimated Value
* = Federal MCL and State criteria exceeded

TABLE 15

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION

<u>Statistical Summary for 1994 OU-2 Groundwater Samples (ug/L)</u>

COMPOUND (ug/L)	MINIMUM DETECTED	AVERAGE OF POSITIVE DETECTIONS	MAXIMUM DETECTED	LOCATION MAXIMUM DETECT	FREQUENCY OF DETECTION	New Jersey GWQS	Federal MCLs	Number Exceeding NJ-GWQS	Range Exceeding NJ-GWQS	Number Exceeding MCLs	Range Exceeding MCLs
Semi-Volatile Organics											
Acenaphthene	0.800	0.800	0.800	MW42	1 / 18	400		0/1			
Benzo(a)pyrene	0.100	0.100	0.100	MW40	1 / 18		0.2			0/1	
4-Methylphenol	0.700	0.700	0.700	MW31	1 / 18						
Diethylphthalate	0.100	0.217	0.500	MW37	6 / 18	5000		0/6			
Phenanthrene	0.200	0.867	2.000	MW37	3 / 18						
Naphthalene	0.600	0.600	0.600	MW37	1 / 18	300		0/1			
2-Methylnaphthalene	0.800	0.800	0.800	MW37	1 / 18						
Dibenzofuran	0.300	0.300	0.300	MW37	1 / 18						
Fluorene	1.000	1.000	1.000	MW37	1 / 18	300		0/1			
Phenol	8.000	8.000	8.000	MW31	1 / 18	4000		0/1			
Anthracene	0.300	0.300	0.300	MW37	1 / 18	2000		0/1			
Pyrene	0.200	0.367	0.600	MW37	3 / 18	200		0/3			
BBP	0.100	0.200	0.300	MW40	3 / 18		100			0/3	
Fluoranthene	0.400	0.450	0.500	MW37	2 / 18	300		0/2			
Pesticides											
4,4'-DDT	0.005	0.005	0.005	MW41	1 / 18	0.1		0/1			
4,4'-DDD	0.008	0.008	0.008	MW41	1 / 18	0.1		0/1			
Heptachlor epoxide	0.009	0.009	0.009	MW35	1 / 18	0.2	0.2	0/1		0/1	

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TABLE 16

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
Statistical Summary of 1996 OU-3 Groundwater Samples (ug/L)

COMPOUND	MINIMUM DETECTED	AVERAGE OF POSITIVE DETECTIONS	MAXIMUM DETECTED	LOCATION MAXIMUM DETECT	FREQUENCY OF DETECTION	New Jersey GWQS	Federal MCL	Number Exceeding NJ-GWQS	Range Exceeding NJ-GWQS	Number Exceeding MCLs	Range Exceeding MCLs
"Total" Inorganics											
Aluminum	28	78	110	MW42	4 / 6	200		0/4			
Arsenic	8.1	8.1	8.1	MW37	1 / 6	8	50	1/1	8-8	0/1	
Barium	23.6	43	73	MW36	6 / 6	2000	1000	0/6		0/6	
Calcium	18,000	31,283	52,100	MW42	6 / 6						
Chromium	4.7	32	44	MW30	4 / 6	100		0/4			
Cobalt	1.3	3.4	5.2	MW36	5 / 6						
Copper	39	39	39	MW42	1 / 6	1000	1300	0/1		0/1	
Iron	306	492	767	MW42	5 / 6	300		5/5	306-767		
Lead	55	61	67	MW42	2 / 6	10	50	2/2	55-67	2/2	55-67
Magnesium	4,170	8,242	16,100	MW42	6 / 6						
Manganese	37	160	414	MW42	6 / 6	50		4/6	101-414		
Nickel	26	37	53	MW30	3 / 6	100	100	0/3		0/3	
Potassium	2,540	4,262	7,340	MW37	6 / 6						
Sodium	10,500	10,900	11,300	MW30	6 / 6	50000		0/6			
Vanadium	1.7	15	31	MW30	5 / 6						
Zinc	91	123	155	MW36	2 / 6	5000		0/2			
"Dissolved" Inorganics											
Aluminum	24	31	37	MW30	6 / 6	200		0/6			
Arsenic	5.3	5.8	6.2	MW37	2 / 6	8	50	0/2		0/2	
Barium	24	42	73	MW36	6 / 6	2000	1000	0/6		0/6	
Calcium	17,800	31,750	54,000	MW42	6 / 6						
Chromium	1.5	7.7	16	MW30	6 / 6	100		0/6			
Cobalt	1.1	2.4	3.6	MW36	2 / 6						
Iron	35	300	564	MW36	2 / 6	300		1/2	564-564		
Lead	4.7	5.6	6.4	MW42	2 / 6	10	50	0/2		0/2	
Magnesium	4,060	8,377	16,800	MW42	6 / 6						
Manganese	2.1	95	174	MW42	5 / 6	50		4/5	96-174		
Potassium	2,620	4,342	7,610	MW37	6 / 6						
Sodium	10,100	10,833	11,300	MW31	6 / 6	50000		0/6			
Vanadium	1.8	17	30	MW30	4 / 6						
Zinc	93	93	93	MW36	1 / 6	5000		0/1			

Total number of samples includes one duplicate

848590125

TABLE 17

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
Statistical Summary for 1995 Residential Well Samples (ug/L)

COMPOUND	MINIMUM DETECTED	AVERAGE OF POSITIVE DETECTIONS	MAXIMUM DETECTED	LOCATION MAXIMUM DETECT	FREQUENCY OF DETECTION	New Jersey GWQS	Federal MCL	Number Exceeding NJ-GWQS	Range Exceeding NJ-GWQS	Number Exceeding MCLs	Range Exceeding MCLs
Volatile Organics											
Chloroform	0.3	0.8	1.3	RW05	2 / 16	6	100	0/2		0/2	
1,1,1-Trichloroethane	0.2	0.3	0.3	RW09, RW10	3 / 16	30	200	0/3		0/3	
Bromomethane	0.4	0.8	1.4	RW11	13 / 16	10		0/13			
Chloromethane	0.8	3.0	10	RW09	13 / 16						
Tetrachloroethene	0.3	0.7	1.4	RW03	5 / 16	1	5	1/5	1-1	0/5	
Toluene	0.2	0.2	0.2	RW10	1 / 16	1000	1000	0/1		0/1	
Total TICS	1.0	5.2	23	RW10	16 / 16						
Semi-Volatile Organics											
bis(2-Ethylhexyl) phthalate	25	25	25	RW01	1 / 16	30	4	0/1		1/1	25-25
Inorganics (Total)											
Aluminum	23	1,241	5,800	RW07	8 / 16	200		6/8	214-5800		
Arsenic	2.2	2.2	2.2	RW15	1 / 16	8	50	0/1		0/1	
Barium	13	50	75	RW06	14 / 16	2000	1000	0/14		0/14	
Beryllium	0.34	0.34	0.34	RW14	1 / 16	20	1	0/1		0/1	
Calcium	47	23,405	103,000	RW07	16 / 16						
Chromium	6.0	6.0	6.0	RW15	1 / 16	100		0/1			
Cobalt	5.5	11	18	RW07	7 / 16						
Copper	3.3	63	191	RW12	8 / 16	1000	1300	0/8		0/8	
Iron	117	7,329	19,600	RW06	13 / 16	300		12/13	428-19600		
Lead	1.3	4.9	11	RW12	9 / 16	10	50	1/9	11-11	0/9	
Magnesium	23	7,322	17,900	RW10	16 / 16						
Manganese	5.3	130	273	RW05	15 / 16	50		14/15	80-273		
Nickel	15	23	32	RW05	7 / 16	100	100	0/7		0/7	
Mercury	0.16	0.18	0.20	RW13	2 / 16	2	2	0/2		0/2	
Potassium	714	3,266	5,990	RW09	15 / 16						
Silver	3.6	3.8	4.0	RW15	2 / 16	2	50	2/2	4-4	0/2	
Sodium	1,900	13,314	37,900	RW10	16 / 16	50000		0/16			
Vanadium	3.2	7.1	11	RW07	2 / 16						
Zinc	3.3	44	131	RW04	16 / 16	5000		0/16			

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TABLE 18
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
SUMMARY OF VOLATILE ORGANIC RESULTS -HYDROPUNCH SAMPLES

Compound	NJ-GWQS (ug/L)	Federal MCL (ug/L)	Minimum Detected	Maximum Detected	Location Maximum Detection	Frequency Of Detection	Average Of Positive Detections	Number Of Samples	Number Exceeding MCLs	Number Exceeding MCLs
2-Butanone	300		5.00	5.00	HP16	1/32	5.00	32	0/32	
1,2-Dichloroethene			6.00	6.00	HP26	1/26	6.00	26		
1,1,1-Trichloroethane	30	200	9.00	9.00	HP15	1/32	9.00	32	0/32	0/32
Acetone	700		13.00	13.00	HP11	1/32	13.00	32	0/32	
Chloroform	6	100	2.00	2.00	HP21	1/32	2.00	32	0/32	
Trichloroethene	1	5	1.00	1.00	HP26	1/32	1.00	32		1/32
Toluene	1000	1000	1.00	1.00	HP03, HP16, HP17	3/35	1.00	35	0/35	0/35
Xylene (total)	1000	10000	1.00	1.00	HP16	1/35	1.00	35		0/35

84859012 7

TABLE 19
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
SUMMARY OF SEMI-VOLATILE ORGANIC RESULTS -HYDROPUNCH SAMPLES

Compound	NJ-GWQS (ug/L)	Federal MCL (ug/L)	Minimum Detected	Maximum Detected	Location of Maximum Detected	Frequency Of Detection	Average Of Positive Detections	Number of Samples	Number Exceeding NJ-GWQS	Number Exceeding MCLs
Acenaphthene	400		9.0	61.0	HP26	2/32	35.000	32	0/32	
Benzoic acid			0.9	2.8	HP11	3/6	1.700	6		
Benzo(a)pyrene		0.02	1.0	10.0	HP26	4/32	4.475	32		4/32
Dibenz[a,h]anthracene		0.3	1.7	1.7	HP26	1/32	1.700	32		1/32
Benzo[a]anthracene		0.1	0.3	17.0	HP26	6/32	4.250	32		4/32
Diethylphthalate	5000		0.2	7.0	HP03	7/32	1.529	32	0/32	
Di-n-butylphthalate	900		0.2	1.7	HP29	6/32	0.667	32	0/32	
Phenanthrene			0.7	130.0	HP26	9/32	17.400	32		
BBP		100	12.0	12.0	HP10	1/32	12.000	32		0/32
Fluorene	300		6.0	55.0	HP26	2/32	30.500	32	0/32	
Carbazole			2.0	2.0	HP10	1/26	2.000	26		
Naphthalene	300		0.7	26.0	HP10	4/32	11.425	32	0/32	
2-Methylnaphthalene			0.8	14.0	HP26	7/32	5.300	32		
4-Nitrophenol			0.7	0.7	HP03	1/32	0.700	32		
Phenol	4000		0.3	0.4	HP11, HP29	2/32	0.350	32	0/32	
bis(2-Ethylhexyl) phthalate	30	4	0.8	86.0	HP28	6/32	17.800	32	1/32	4/32
Anthracene	2000		1.1	26.0	HP26	3/32	9.700	32	0/32	
Pyrene	200		0.5	60.0	HP26	7/32	11.143	32	0/32	
Dimethylphthalate			1.0	1.0	HP25	1/32	1.000	32	0/32	
Dibenzofuran			0.4	28.0	HP26	4/32	8.575	32		
Benzo(g,h,i)perylene			1.0	6.1	HP26	4/32	3.225	32		
Indeno[1,2,3-cd]pyrene			0.9	6.9	HP26	4/32	3.300	32		
Benzo[b]fluoranthene		0.2	0.4	18.0	HP26	7/32	4.357	32		7/32
Fluoranthene	300		0.9	88.0	HP26	6/32	10.083	32	0/32	
Benzo[k]fluoranthene		0.2	0.5	6.9	HP26	4/32	3.150	32		4/32
Acenaphthylene			0.8	3.0	HP26	2/32	1.900	32		
Chrysene	20	0.2	0.5	23.0	HP26	8/32	4.550	32	1/32	8/32
Bis(2-chloroisopropyl) ether			0.0	0.0	HP11, HP26, HP28,	6/12	0.000	12		

TABLE 20
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
SUMMARY OF TOTAL METAL RESULTS - HYDROPUNCH SAMPLES

Compound	NJ-GWQS (ug/L)	Federal MCL (ug/L)	Minimum Detection	Maximum Detection	Location of Maximum Detect	Frequency of Detection	Average of Positive Detection	Number of Samples	Number Exceeding NJ-GWQS	Number Exceeding MCLs
Aluminum	200		1240	141000	HP23	19/19	39416	19	19/19	
Antimony	20	5	6	6	HP10	1/19	6	19	0/19	1/19
Arsenic	8	50	3	495	HP27	19/19	101	19	14/19	7/19
Barium	2000	1000	9	730	HP29	18/19	299	19	0/19	0/19
Beryllium	20	1	0	16	HP28	11/19	7	19	0/19	8/19
Cadmium	4	10	2	18	HP25	3/19	8	19	2/19	1/19
Calcium			16100	144000	HP28	19/19	57100	19		
Chromium	100		7	1650	HP29	19/19	409	19	11/19	
Cobalt			2	192	HP29	14/19	41	19		
Copper	1000	1000	15	60400	HP28	19/19	4669	19	9/19	9/19
Iron	300		3140	1070000	HP29	19/19	225788	19	19/19	
Lead	10	50	8	4410	HP28	19/19	677	19	18/19	16/19
Magnesium			2210	44300	HP24	18/19	13963	19		
Manganese	50		20	5730	HP28	19/19	1531	19	18/19	
Mercury	2	2	0	5	HP28	10/19	1	19	1/19	1/19
Nickel	100	100	4	1010	HP29	19/19	171	19	8/19	8/19
Potassium			2040	17000	HP29	18/19	8060	19		
Selenium	50	10	3	39	HP26	9/19	14	19	0/19	5/19
Silver	2	50	2	2	HP25	1/19	2	19	0/19	0/19
Sodium	50000		2330	25000	HP21	13/19	7033	19	0/19	
Thallium	10	1	11	21	HP09	4/19	18	19	3/19	3/19
Vanadium			8	2560	HP29	19/19	541	19		
Zinc	5000		147	11300	HP29	19/19	2010	19	3/19	

TABLE 21
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
SUMMARY OF FILTERED METAL RESULTS - HYDROPUNCH SAMPLES

Compound	NJ-GWQS (ug/L)	Federal MCL (ug/L)	Minimum Detected	Maximum Detected	Location of Maximum Detected	Frequency of Detection	Average of Detection	Number of Samples	Number Exceeding NJ-GWQS	Number Exceeding MCLs
Aluminum	200		21	9190	HP21	11/19	1040	19	4/19	
Arsenic	8	50	2	48	HP27	8/19	10	19	1/19	0/19
Barium	2000	1000	4	82	HP23	11/19	30	19	0/19	0/19
Beryllium	20	1	1	2	HP10	5/19	1	19	0/19	1/19
Cadmium	4	10	1	1	HP21	1/19	1	19	0/19	0/19
Calcium			131	85600	HP24	18/19	37202	19		
Chromium	100		3	45	HP21	2/19	24	19	0/19	
Cobalt			1	16	HP23	6/19	8	19		
Copper	1000	1000	2	1690	HP21	7/19	294	19	1/19	1/19
Iron	300		38	33500	HP22	15/19	6414	19	13/19	
Lead	10	50	4	30	HP21	4/19	16	19	2/19	0/19
Magnesium			1760	45300	HP24	13/19	10841	19		
Manganese	50		14	4200	HP21	17/19	497	19	15/19	
Nickel	100	100	4	48	HP21	8/19	18	19	0/19	0/19
Potassium			1440	13000	HP29	12/19	4980	19		
Selenium	50	10	2	8	HP29	5/19	5	19	0/19	0/19
Silver	2	50	2	2	HP10	1/19	2	19	0/19	0/19
Sodium	50000		543	33800	HP21	15/19	6700	19	0/19	
Vanadium			3	21	HP21	3/19	9	19		
Zinc	5000		23	931	HP23	17/19	202	19	0/19	

TABLE 22
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
STATISTICAL SUMMARY FOR SRI 1997 "DEEP" GROUNDWATER SAMPLES

COMPOUND/ANALYTE (ug/L)	MINIMUM DETECTED	AVERAGE OF POSITIVE DETECTIONS	MAXIMUM DETECTED	LOCATION MAXIMUM DETECT	FREQUENCY OF DETECTION	New Jersey GWQS	Federal MCL	Number Exceeding NJ-GWQS	Range Exceeding NJ-GWQS	Number Exceeding MCLs	Range Exceeding MCLs
Volatile Organics											
1,1-Dichloroethane	3.0	3.0	3.0	MW32D	1 / 12	50		0/1			
Semi-Volatile Organics											
Diethylphthalate	0.2	0.2	0.2	MW20D	1 / 12	5000		0/1			
Phenanthrene	0.5	0.5	0.5	MW14D	2 / 12						
Naphthalene	0.6	0.6	0.6	MW17D	1 / 12	300		0/1			
2-Methylnaphthalene	0.6	0.6	0.6	MW17D	1 / 12						
Phenol	0.6	1.2	2.0	MW16D	3 / 12	4000		0/3			
bis(2-Ethylhexyl) phthalate	1.0	1.0	1.0	MW14D	1 / 12	30	4	0/1		0/1	
"Total" Inorganics											
Aluminum	54	1,213	7,140	MW16D	10 / 12	200		9/10	301-7140		
Arsenic	83	89	95	MW17D	2 / 12	8	50	2/2	83-95	2/2	83-95
Barium	20	258	500	MW14D	8 / 12	2000	1000	0/8		0/8	
Beryllium	1.5	1.5	1.5	MW16D, MW17D	2 / 12	20	1	0/2		2/2	2-2
Calcium	11,000	147,575	384,000	MW14D, MW14D	12 / 12						
Chromium	8.8	19	30	MW16D	2 / 12	100		0/2			
Cobalt	4.6	37	57	MW32D	5 / 12						
Copper	3.3	10	16	MW16D	2 / 12	1000	1300	0/2		0/2	
Iron	93	86,939	274,000	MW32D	10 / 12	300		7/10	10800-274000		
Lead	2	4	8	MW16D	5 / 12	10	50	0/5		0/5	
Magnesium	2,750	13,692	25,000	MW32D	6 / 12						
Manganese	21	5,221	13,900	MW32D	8 / 12	50		7/8	149-13900		
Mercury	0.64	0.64	0.64	MW32D	1 / 12	2	2	0/1		0/1	
Nickel	5	20	35	MW32D	5 / 12	100	100	0/5		0/5	
Potassium	13	13,563	32,000	MW14D	11 / 12						
Silver	2.3	2.5	2.6	MW32D	2 / 12	2	50	2/2	2-3	0/2	
Sodium	13	36,901	159,000	MW17D	12 / 12	50000		2/12	145000-159000		
Vanadium	2.9	12	22	MW16D	2 / 12						
Zinc	12	8,297	20,700	MW32D	7 / 12	5000		3/7	18400-20700		
"Dissolved" Inorganics											
Aluminum	144	336	467	MW14D	7 / 12	200		5/7	268-467		
Arsenic	86	88	90	MW17D	2 / 12	8	50	2/2	86-90	2/2	86-90
Barium	30	262	499	MW14D	8 / 12	2000	1000	0/8		0/8	
Beryllium	1.3	1.3	1.3	MW17D	1 / 12	20	1	0/1		1/1	1-1
Calcium	12,000	149,892	397,000	MW14D	12 / 12						
Cobalt	2.5	23	56	MW32D	3 / 12						
Iron	23	38,874	257,000	MW32D	8 / 12	300		5/8	4220-257000		
Lead	2.5	3.4	4.7	MW16D	4 / 12	10	50	0/4		0/4	
Magnesium	2,630	7,163	24,000	MW32D	6 / 12						
Manganese	7.6	1,807	13,800	MW32D	8 / 12	50		5/8	140-13800		
Nickel	5.4	10	18	MW17D	3 / 12	100	100	0/3		0/3	
Potassium	4,830	14,893	33,000	MW14D	11 / 12						
Sodium	8,440	38,495	144,000	MW17D, MW17D	11 / 12	50000		2/11	144000-144000		
Vanadium	7.6	7.9	8.1	MW32D	2 / 12						
Zinc	11	3,361	20,000	MW32D	6 / 12	5000		1/6	20000-20000		

Sample count includes duplicate for each round (five wells & deep)

TABLE 23
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
STATISTICAL SUMMARY FOR 1997 SRI GROUNDWATER SAMPLES (UG/L)

CONSTITUENT	MINIMUM DETECTED	AVERAGE OF POSITIVE DETECTIONS	MAXIMUM DETECTED	LOCATION MAXIMUM DETECT	FREQUENCY OF DETECTION	New Jersey GWQS	Federal MCLs	Number Exceeding NJ-GWQS	Range Exceeding NJ-GWQS	Number Exceeding MCLs	Range Exceeding MCLs
Volatile Organics											
Trichloroethene	3	3	3	MW01	1 / 24	1	5	1/1	3-3	0/1	
"Total" Inorganics											
Aluminum	37.9	2,390	14,400	MW14S	8 / 24	200		4/8	315-14400		
Arsenic	2.3	3.5	4.6	MW07	5 / 24	8	50	0/5		0/5	
Barium	3.5	28	51	MW08D	9 / 24	2000	1000	0/9		0/9	
Beryllium	0.14	11	22	MW24D	2 / 24	20	1	1/2	22-22	1/2	22-22
Cadmium	0.32	0.56	1.20	MW18D	4 / 24	4	10	0/4		0/4	
Calcium	8,000	45,868	137,000	MW10	22 / 24						
Chromium	0.84	15	54	MW24D	6 / 24	100		0/6			
Cobalt	2.60	32	61	MW24D	4 / 24						
Copper	1.80	4.7	11.8	MW18D	9 / 24	1000	1300	0/9		0/9	
Iron	41.2	34,325	330,000	MW24D	18 / 24	300		11/18	1380-330000		
Lead	3.5	5.0	7.9	MW09	5 / 24	10	50	0/5		0/5	
Magnesium	5,000	22,409	94,000	MW10	19 / 24						
Manganese	0.9	1,552	15,300	MW24D	18 / 24	50		10/18	65-15300		
Nickel	10	37	91	MW24D	4 / 24	100	100	0/4		0/4	
Mercury	0.32	0.32	0.32	MW12	1 / 24	2	2	0/1		0/1	
Potassium	2,090	7,375	25,000	MW20	15 / 24						
Selenium	2.30	4.87	6.40	MW17	3 / 24	50	10	0/3		0/3	
Silver	1.60	1.60	1.60	MW18D	1 / 24	2	50	0/1		0/1	
Sodium	2,190	14,731	50,500	MW20	21 / 24	50000		1/21	50500-50500		
Vanadium	4.00	7.35	10.70	MW08	2 / 24						
Zinc	6.0	1,419	14,400	MW24D	14 / 24	5000		1/14	14400-14400		

Total number of samples includes one duplicate

848590132

TABLE 24
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
STATISTICAL SUMMARY FOR 1998 SRI GROUNDWATER SAMPLES (UG/L)

COMPOUND	MINIMUM DETECTED	AVERAGE OF POSITIVE DETECTIONS	MAXIMUM DETECTED	LOCATION MAXIMUM DETECT	FREQUENCY OF DETECTIONS	New Jersey GWQS	Federal MCLs	Number Exceeding NJ-GWQS	Range Exceeding NJ-GWQS	Number Exceeding MCLs	Range Exceeding MCLs
Volatile Organics											
2-Butanone	5	5	5	MW26	1 / 3	300		0/1			
Acetone	5	5	5	MW26	1 / 3	700		0/1			
Chloromethane	1	1	1	MW06	1 / 3						
"Total" Inorganics											
Aluminum	275	567	1,000	SP02-201	3 / 27	200		3/3	275-1000		
Arsenic	10.6	13.1	14.6	MW38	3 / 27	8	50	3/3	11-15	0/3	
Cadmium	0.23	0.59	1.12	MW26	7 / 27	4.	10	0/7		0/7	
Calcium	7,000	29,857	54,000	MW42	28 / 27						
Chromium	11.0	16.4	22	SP01-201	7 / 27	100		0/7			
Copper	7.0	12.5	25	MW41	8 / 27	1000	1300	0/8		0/8	
Iron	119	1,150	7,450	MW40	14 / 27	300		8/14	308-7450		
Lead	0.8	13.2	92	SP02-201	15 / 27	10	50	3/15	36-92	1/15	92-92
Magnesium	5,000	13,947	30,000	SP04-201, SP04-301	19 / 27						
Manganese	16	139	449	MW40	18 / 27	50		13/18	52-449		
Potassium	6,000	7,000	8,000	MW37	4 / 27						
Sodium	7,000	10,000	20,000	MW41	27 / 27	50000		0/27			
Vanadium	77	77	77	MW34	1 / 27						
Zinc	20	59	166	SP02-201	11 / 27	5000		0/11			
"Dissolved" Inorganics											
Cadmium	0.41	0.41	0.41	MW08S	1 / 17	4	10	0/1		0/1	
Calcium	16,000	30,412	56,000	MW42	17 / 17						
Chromium	11.0	13.0	16.0	MW30	3 / 17	100		0/3			
Copper	4.0	11.1	22.0	SP04-201	14 / 17	1000	1300	0/14		0/14	
Magnesium	5,000	13,923	32,000	SP04-201, SP04-301	13 / 17						
Manganese	100	152	204	MW42	2 / 17	50		2/2	100-204		
Potassium	5,000	6,500	8,000	MW37	2 / 17						
Sodium	7,000	10,118	13,000	MW42	17 / 17	50000		0/17			
Zinc	33	55	115	MW42	4 / 17	5000		0/4			

TABLE 25
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
STATISTICAL SUMMARY FOR 1989 MAIN CHANNEL SURFACE WATER SAMPLES

COMPOUND	MINIMUM DETECTED	AVERAGE OF POSITIVE DETECTIONS	MAXIMUM DETECTED	LOCATION MAXIMUM DETECT	FREQUENCY OF DETECTION	MINIMUM SWAQD	MINIMUM SWAQT	MINIMUM SWHHT	Number Exceeding MIN-SWAQD	Range Exceeding MIN-SWAQD	Number Exceeding MIN-SWAQT	Range Exceeding MIN-SWAQT	Number Exceeding MIN-SWHHT	Range Exceeding MIN-SWHHT
Volatile Organics (ug/l)														
Total TICS	8	10	12	SW04	2 / 13									
"Total" Inorganics (ug/l)														
Aluminum	143	246	358	SW10	13 / 13		87				13/13	143-358		
Barium	27.5	29	30	SW10	13 / 13			1000					0/13	
Calcium	12,200	12,708	13,400	SW09B	13 / 13									
Copper	5.2	8	11	SW04A	9 / 13	4.27	4.45	1300	9/9	5-11	9/9	5-11	0/9	
Iron	326	451	637	SW10	13 / 13			300					13/13	326-637
Lead	1.1	1.6	3.6	SW04	10 / 13	0.97	1.05	5	10/10	1-4	10/10	1-4	0/10	
Magnesium	3,600	3,825	4,160	SW09A	13 / 13									
Manganese	53	72	99	SW13	13 / 13			50					13/13	53-99
Potassium	1,040	1,184	1,370	SW04A	12 / 13									
Sodium	5,030	6,894	8,810	SW09A	13 / 13									
Vanadium	3.2	3.2	3.2	SW14	1 / 13									
Zinc	15	18	21	SW10	6 / 13	50.11	50.82	9100	0/6		0/6		0/6	
Other (mg/l)														
Total organic carbon	3.3	3.8	4.5	SW11	20 / 13									

MIN-SWAQD: Based on most stringent criteria comparing aquatic-dissolved standards from NAWQC and DRBC
MIN-SWAQT: Based on most stringent criteria comparing aquatic-total standards from New Jersey, NAWQC and DRBC
MIN-SWHHT: Based on most stringent criteria comparing human health standards from New Jersey, NAWQC and DRBC

TABLE 26
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
STATISTICAL SUMMARY FOR BACK CHANNEL SURFACE WATER SAMPLES

COMPOUND	MINIMUM DETECTED	AVERAGE OF POSITIVE DETECTIONS	MAXIMUM DETECTED	LOCATION MAXIMUM DETECT	FREQUENCY OF DETECTION	MINIMUM SWAQD	MINIMUM SWAQT	MINIMUM SWHHT	Number Exceeding MIN-SWAQD	Range Exceeding MIN-SWAQD	Number Exceeding MIN-SWAQT	Range Exceeding MIN-SWAQT	Number Exceeding MIN-SWHHT	Range Exceeding MIN-SWHHT
"Total" Inorganics (ug/l)														
Aluminum	34	455	1,890	SW46	22 / 22		87				15/22	90-1890		
Barium	24	29	38	SW33	22 / 22			1000					0/22	
Calcium	7,910	12,701	13,600	SW22, SW25, SW26, SW43	22 / 22									
Copper	2.4	4.9	8.2	SW08A	19 / 22	4.27	4.45	1300	12/19	5-8	12/19	5-8	0/19	
Iron	235	1,063	4,470	SW27	22 / 22			300					19/22	302-4470
Lead	1.3	3.4	11	SW33	22 / 22	0.97	1.05	5	22/22	1-11	22/22	1-11	2/22	7-11
Magnesium	2,440	4,421	6,140	SW33	22 / 22									
Manganese	40	78	242	SW33	22 / 22			50					14/22	52-242
Nickel	3.7	6.6	9.4	SW20	2 / 22	24.96	25.04	100	0/2		0/2		0/2	
Potassium	1,070	1,665	3,260	SW33	22 / 22									
Silver	4.7	4.7	4.7	SW32	1 / 22	0.78	0.91	50	1/1	5-5	1/1	5-5	0/1	
Sodium	4,660	7,876	13,100	SW33	22 / 22									
Vanadium	2.3	3.1	3.5	SW33, SW46	4 / 22									
Zinc	18	25	33	SW43	18 / 22	50.11	50.82	9100	0/18		0/18		0/18	
Other Water Quality Parameters (mg/l)														
Alkalinity (as $CaCO_3$)	17	32	36	SW22	16 / 22									
Chloride	8	13	28	SW33	16 / 22			250000					0/16	
Hardness (as $CaCO_3$)	30	47	52	SW27, SW43	16 / 22									
Residue, filterable	58	99	130	SW33	16 / 22									
Residue, non-filterable	13	22	32	SW43	7 / 22									
Chemical Oxygen Demand	8	8	8	SW08	2 / 22									
Total organic carbon	3	6	12	SW43, SW45	28 / 22									

MIN-SWAQD: Based on most stringent criteria comparing aquatic-dissolved standards from NAWQC and DRBC
MIN-SWAQT: Based on most stringent criteria comparing aquatic-total standards from New Jersey, NAWQC and DRBC
MIN-SWHHT: Based on most stringent criteria comparing human health standards from New Jersey, NAWQC and DRBC

TABLE 27
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE - REMEDIAL INVESTIGATION
STATISTICAL SUMMARY FOR CRAFTS CREEK SURFACE WATER SAMPLES

COMPOUND	MINIMUM DETECTED	AVERAGE OF POSITIVE DETECTIONS	MAXIMUM DETECTED	LOCATION MAXIMUM DETECT	FREQUENCY OF DETECTION	MINIMUM SWAQD	MINIMUM SWAQT	MINIMUM SWHHT	Number Exceeding MIN-SWAQD	Range Exceeding MIN-SWAQD	Number Exceeding MIN-SWAQT	Range Exceeding MIN-SWAQT	Number Exceeding MIN-SWHHT	Range Exceeding MIN-SWHHT
Volatile Organics (ug/l)														
Carbon disulfide	11	11	11	SW16	1 / 18									
Total TICS	6	56	132	SW17	3 / 18									
"Total" Inorganics (ug/l)														
Aluminum	84	1,416	3,940	SW42	18 / 18		87				17/18	98-3940		
Arsenic	1.9	4.4	7.1	SW44	3 / 18			0.017					3/3	2-7
Barium	27	36	60	SW19	18 / 18			1000					0/18	
Calcium	6,550	10,858	16,100	SW17	18 / 18									
Copper	3.7	12	35	SW17	10 / 18	4.27	4.45	1300	7/10	5-35	7/10	5-35	0/10	
Iron	444	6,087	16,700	SW44	14 / 18			300					14/14	444-16700
Lead	1.2	6.2	21	SW19	18 / 18	0.97	1.05	5	18/18	1-21	18/18	1-21	9/18	5-21
Magnesium	3,330	5,140	9,110	SW19	18 / 18									
Manganese	63	184	472	SW18	18 / 18			50					18/18	63-472
Nickel	5.5	6.5	9.3	SW44	5 / 18	24.96	25.04	100	0/5		0/5		0/5	
Potassium	1,550	3,957	6,720	SW42	18 / 18									
Silver	3.9	4.9	6.5	SW37	3 / 18	0.78	0.91	50	3/3	4-7	3/3	4-7	0/3	
Sodium	4,770	8,648	16,100	SW18	18 / 18									
Vanadium	2.4	7.1	14	SW44	11 / 18									
Zinc	19	34	111	SW17	18 / 18	50.11	50.82	9100	2/18	96-111	2/18	96-111	0/18	
Other Water Quality Parameters (mg/l)														
Alkalinity (as CaCO3)	5.4	19	35	SW30	13 / 18									
Chloride	11	16	27	SW41	13 / 18			250000					0/13	
Hardness (as CaCO3)	32	42	57	SW44	13 / 18									
Residue, filterable	105	130	181	SW42	13 / 18									
Residue, non-filterable	6.0	37	109	SW44	11 / 18									
Total organic carbon	6.0	11	15	SW37	14 / 18									

MIN-SWAQD: Based on most stringent criteria comparing aquatic-dissolved standards from NAWQC and DRBC
MIN-SWAQT: Based on most stringent criteria comparing aquatic-total standards from New Jersey, NAWQC and DRBC
MIN-SWHHT: Based on most stringent criteria comparing human health standards from New Jersey, NAWQC and DRBC

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TABLE 28.1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Roebling Steel Company Superfund Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (10)	Background Value (2)	Screening Toxicity Value (3)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
74-87-3	Methyl Chloride	8.00	J	100	J	ug/kg	RS-DD01-01	5/70	5.00-47.0	100	N/A	280,000 (e)	49000 C	RBC	NO	BSL
71-55-6	1,1,1-trichloroethane	2.00	J	6.00		ug/kg	RS-SB33-01	5/70	5.00-12.0	6.00	N/A	210,000 (a)	1600000 N	RBC	NO	BSL
127-18-4	Tetrachloroethane	3.00	J	12.0	J	ug/kg	RS-DB01-01	7/69	5.00-12.0	12.0	N/A	4,000 (a)	12000 C	RBC	NO	BSL
													12,000	USEPA SSL		
75-27-4	Bromodichloromethane	4.00	J	6.00	J	ug/kg	RS-MWD5-01	2/69	5.00-12.0	6.00	N/A	11,000 (e)	10000 C	RBC	NO	BSL, IFD
													10,000	USEPA SSL		
108-90-7	Chlorobenzene	45.0	J	68.0		ug/kg	RS-DB02-02	6/68	6.00-12.0	68.0	N/A	37,000 (e)	1.56E+06 N	RBC	NO	BSL
													1.56E+06 N	USEPA SSL		
71-43-2	Benzene	2.00	J	2.00	J	ug/kg	RS-MW2101	2/69	6.00-12.0	2.00	N/A	3,000 (e)	22026 C	RBC	NO	BSL, IFD
													800	USEPA SSL		
108-88-3	Toluene	2.00	J	150		ug/kg	RS-SB33-01	22/69	6.00-12.0	150	N/A	1.00E+06 (e)	1.56E+07 N	RBC	NO	BSL
													1.60E+07	USEPA SSL		
100-41-4	Ethylbenzene	2.00	J	75.0		ug/kg	RS-SB33-01	4/67	6.00-12.0	75.0	N/A	1.00E+06 (a)	7.82E+06 N	RBC	NO	BSL
													7.80E+06	USEPA SSL		
1330-20-7	Total Xylenes	1.00	J	330		ug/kg	RS-SB33-01	9/69	6.00-12.0	330	N/A	410,000 (e)	1.56E+06 N	RBC	NO	BSL
													1.60E+08	USEPA SSL		
67-64-1	Acetone	16.0	J	70.0	J	ug/kg	RS-DB01-02	5/64	10.0-120	70.0	N/A	1.00E+06 (a)	7.8E+06 N	RBC	NO	BSL
													7.80E+06	USEPA SSL		
78-93-3	2-butanone	1.00	J	2.00	J	ug/kg	RS-DB01-01	2/66	10.0-16.0	2.00	N/A	1.00E+06 (a)	4.69E+07 N	RBC	NO	BSL, IFD
67-66-3	Chloroform	1.00	J	17.0	J	ug/kg	RS-MWD5-01	11/70	6.00-12.0	17.0	N/A	19,000 (e)	100000 C	RBC	NO	BSL
													100,000	USEPA SSL		
75-15-0	Carbon Disulfide	2.00	J	2.00	J	ug/kg	RS-DB02-01	1/69	6.00-12.0	2.00	N/A	7.80E+06 (b)	7.82E+06 N	RBC	NO	BSL, IFD
108-95-2	Phenol	2.00	J	3,100	J	ug/kg	RS-MW25-01	5/77	340-7,700	3,100	N/A	1.00E+07 (e)	4.69E+07 N	RBC	NO	BSL
													4.70E+07	USEPA SSL		
95-48-7	2-Methylphenol	170	J	170	J	ug/kg	RS-SB22-01	1/74	340-7,700	170	N/A	2.60E+06 (e)	3.91E+06 N	RBC	NO	BSL, IFD
													3.90E+06	USEPA SSL		
106-44-5	4-Methylphenol	24.0	J	200	J	ug/kg	RCSSB091A1	8/74	340-7,700	200	N/A	2.60E+06 (e)	391071 N	RBC	NO	BSL
105-67-9	2,4-Dimethylphenol	33.0	J	33.0	J	ug/kg	RCSSB241S1	1/135	340-21,000	33.0	N/A	1.60E+06 (b)	1.56e+06 N	RBC	NO	BSL, IFD
59-50-7	4-Chloro-3-Methylphenol	30.0	J	42.0	J	ug/kg	RCSES0101	3/135	340-21,000	42.0	N/A	1.00E+07 (e)			NO	BSL, IFD
100-02-7	4-nitrophenol	860	JN	860	JN	ug/kg	RS-SB08-02	1/134	800-100,000	860	N/A	626,714 (c)	-	-	NO	BSL, IFD
87-86-5	Pentachlorophenol	24.0	J	12,000	J	ug/kg	RS-SB29-01	4/135	880-19,000	12,000	N/A	6,000 (e)	5322 C	RBC	YES	ASL, HIST

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TABLE 26.1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Roebling Steel Company Superfund Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (10)	Background Value (2)	Screening Toxicity Value (3)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
131-11-3	Dimethyl Phthalate	60.0	J	440		ug/kg	RCSSB6D1W1	3/136	11.0-21,000	440	N/A	1.00E+07 (a)	3,000 7.82E+06 N	USEPA SSL RBC	NO	BSL, IFD
84-66-2	Diethylphthalate	24.0	J	280	J	ug/kg	RS-DB01-02	8/136	11.0-21,000	280	N/A	1.00E+07 (a)	6.3E+07 N	RBC	NO	BSL, IFD
84-74-2	Di-n-Butylphthalate	19.0	J	140,000	J	ug/kg	RS-SB33-01	49/136	11.0-12,000	140,000	N/A	5.70E+06 (a)	6.30E+07 7.8E+06 N	USEPA SSL RBC	NO	BSL
85-68-7	Butyl Benzyl Phthalate	22.0	J	160,000	J	ug/kg	RS-SB33-01	54/129	11.0-12,000	160,000	N/A	1.10E+06 (a)	1.6E+07 N	RBC	NO	BSL
117-84-0	Di-n-Octyl Phthalate	20.0	J	200	J	ug/kg	RCDSS17101	8/125	11.0-21,000	200	N/A	1.10E+06 (a)	1.60E+07 1.56E+06 N	USEPA SSL RBC	NO	BSL
111-44-4	Bis(2-ethylhexyl)Phthalate	29.0	J	170,000	J	ug/kg	RS-SB33-01	60/134	11.0-29,000	170,000	N/A	49,000 (a)	1.60E+06 46000 C	USEPA SSL RBC	YES	ASL, FD
7005-72-3	4-Chlorophenyl Phenyl Ether	4,500	J	4,600	J	ug/kg	RS-SB33-01	1/136	11.0-12,000	4,500	N/A	1.0E+07 (a)	46,000 -	USEPA SSL -	NO	BSL, IFD
100-01-6	4-Nitroaniline	29.0	J	65.0	J	ug/kg	RCSSB061S1	3/136	54.0-100,000	65.0	N/A	-	-	-	NO	NTX, IFD
86-30-6	N-Nitrosodiphenylamine	27.0	J	32,000	J	ug/kg	RS-SB33-01	8/136	11.0-12,000	32,000	N/A	140,000 (a)	130352 C	RBC	NO	BSL
98-95-3	Nitrobenzene	26.0	J	880	J	ug/kg	RS-SB26-02	5/136	11.0-12,000	880	N/A	20,000 (a)	130,000 39107 N	USEPA SSL RBC	NO	BSL, IFD
541-73-1	1,3-Dichlorobenzene	19.0	J	19.0	J	ug/kg	RCDSB241S1	1/73	340-7,700	19.0	N/A	6.10E+06 (a)	39,000 2.35E+06 N	USEPA SSL RBC	NO	BSL, IFD
106-46-7	1,4-Dichlorobenzene	5.00	JN	53.0	J	ug/kg	RCSSS06101	18/75	340-7,700	53.0	N/A	670,000 (a)	26613 N	RBC	NO	BSL
91-94-1	3,3-Dichlorobenzidine	850	J	850	J	ug/kg	RS-SB30-01	1/126	22.0-24,000	850	N/A	2,000 (a)	27,000 1419 C	USEPA SSL RBC	NO	BSL, IFD
118-74-1	Hexachlorobenzene	62.0	J	1,500	J	ug/kg	RCSSS18101	4/136	11.0-21,000	1,500	N/A	600 (a)	1,000 399 C	USEPA SSL RBC	YES	ASL, HIST
121-14-2	2,4-Dinitrotoluene	15,000		15,000		ug/kg	RS-SB25-02	1/136	11.0-21,000	15,000	N/A	900 (b)	400 156428 N	USEPA SSL RBC	YES	ASL, HIST
65-85-0	Benzoic Acid	41.0	J	720	J	ug/kg	RS-MW21-01	11/57	1,700-59,000	720	N/A	3.10E+05 (b)	3.10E+08 N	RBC	NO	BSL
91-20-3	Naphthalene av	20.0	J	26,000	J	ug/kg	RS-SB33-01	80/136	11.0-12,000	26,000	N/A	230,000 (a)	3.10E+06 N	RBC	NO	BSL
91-57-6	2-Methylnaphthalene	32.0	J	300,000	J	ug/kg	RS-SB33-01	83/136	11.0-12,000	300,000	N/A	3.10E+06 (c)	3.10E+06 -	USEPA SSL -	NO	BSL
86-74-8	Carbazole	18.0	J	1,800		ug/kg	RCSSB241E1	43/73	340-400	1,800	N/A	32,000 (b)	32000 C	RBC	NO	BSL
132-64-9	Dibenzofuran	19.0	J	36,000	J	ug/kg	RS-SB33-01	60/136	11.0-12,000	36,000	N/A	310,000 (c)	-	-	NO	BSL
83-32-9	Acenaphthene	19.0	J	35,000	J	ug/kg	RS-SB33-01	34/136	11.0-12,000	35,000	N/A	3.40E+06 (a)	4.7E+06 N	RBC	NO	BSL

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TABLE 28.1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Roebling Steel Company Superfund Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (10)	Background Value (2)	Screening Toxicity Value (3)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
													4.70E+06	USEPA SSL		
208-96-8	Acenaphthylene	22.0	J	3,000		ug/kg	RCSSB091A1	51/136	11.0-12,000	3,000	N/A	-	-	-	YES	FD
120-12-7	Anthracene	18.0	J	12,000	J	ug/kg	RS-SB33-01	78/136	11.0-12,000	12,000	N/A	1.00E+07 (a)	2.30E+07 N 2.30E+07	RBC USEPA SSL	NO	BSL
50-32-8	Benzo(a)Pyrene	19.0	J	17,000		ug/kg	RCSSB091A1	100/134	11.0-8,100	17,000	N/A	880 (a)	88 C 90	RBC USEPA SSL	YES	ASL, FD
191-24-2	Benzo(g,h,i)perylene	22.0	J	10,000		ug/kg	RCSSB091A1	93/133	11.0-21,000	10,000	N/A	-	-	-	YES	FD
56-55-3	Benzo(a)anthracene	23.0	J	20,000		ug/kg	RCSSB091A1	106/135	11.0-6,100	20,000	N/A	900 (a)	880 C 900	RBC USEPA SSL	YES	ASL, FD
205-99-2	Benzo(b)fluoranthene	29.0	J	16,000		ug/kg	RCSSB091A1	109/134	11.0-3,700	16,000	N/A	900 (a)	880 C 900	RBC USEPA SSL	YES	ASL, FD
207-08-9	Benzo(k)fluoranthene	20.0	J	15,000		ug/kg	RCSSB091A1	79/105	11.0-3,700	15,000	N/A	900 (a)	8800 C 9,000	RBC USEPA SSL	YES	ASL, FD
218-01-9	Chrysene	32.0	J	18,000		ug/kg	RCSSB091A1	120/134	11.0-920	18,000	N/A	9,000 (a)	88000 C 88,000	RBC USEPA SSL	YES	ASL, FD
53-70-3	Dibenz(a,h)anthracene	16.0	J	8,300	J	ug/kg	RCSSB091A1	67/128	11.0-21,000	8,300	N/A	880 (a)	88 C 90	RBC USEPA SSL	YES	ASL, FD
206-44-0	Fluoranthene	27.0	J	38,000		ug/kg	RCSSB091A1	121/136	11.0-1,100	38,000	N/A	2.30E+06 (a)	3.1E+06 N 3.10E+06	RBC USEPA SSL	NO	BSL
86-73-7	Fluorene	19.0	J	60,000	J	ug/kg	RS-SB33-01	38/136	11.0-12,000	60,000	N/A	2.30E+06 (a)	3.1E+06 N 3.10E+06	RBC USEPA SSL	NO	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	21.0	J	9,700		ug/kg	RCSSB091A1	94/134	11.0-12,000	9,700	N/A	900 (a)	880 C 900	RBC USEPA SSL	YES	ASL, FD
85-01-8	Phenanthrene	32.0	J	140,000	J	ug/kg	RS-SB33-01	114/136	11.0-1,100	140,000	N/A	-	-	-	YES	FD
129-00-0	Pyrene	26.0	J	67,000	J	ug/kg	RS-SB33-01	121/135	11.0-3,600	67,000	N/A	1.70E+06 (a)	2.3E+06 N 2.30E+06	RBC USEPA SSL	NO	BSL
72-54-8	4,4'-DDD	5.20		200	J	ug/kg	RCSTS86*C1	12/122	0.200-390	200	N/A	3,000 (a)	2700 C 3,000	RBC USEPA SSL	NO	BSL
72-55-9	4,4'-DDE	1.00E-01	J	210	J	ug/kg	RCSTS10D1	40/125	0.200-390	210	N/A	2,000 (a)	1900 C 2,000	RBC USEPA SSL	NO	BSL
50-29-3	4,4'-DDT	2.00E-02	J	370	JN	ug/kg	RCSSS18101	35/127	0.200-390	370	N/A	2,000 (a)	1900 C 2,000	RBC USEPA SSL	NO	BSL

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TABLE 28.1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Roebling Steel Company Superfund Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (10)	Background Value (2)	Screening Toxicity Value (3)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
309-00-2	Aldrin	1.80	J	270		ug/kg	RCDSS17101	25/129	0.100-200	270	N/A	40 (a)	30 C 40	RBC USEPA SSL	YES	ASL, FD
319-84-6	Alpha-BHC	2.90		2.90		ug/kg	RCSSS08101	1/133	0.100-200	2.90	N/A	100 (b)	110	RBC	NO	BSL, IFD
319-85-7	Beta-BHC	2.00	J	160	JN	ug/kg	RS-MW27-01	7/132	0.100-200	160	N/A	400 (b)	350	RBC	NO	BSL
319-86-8	Delta-BHC	8.00E-01	J	8.00E-01	J	ug/kg	RCSES0701	1/116	0.100-200	8.00E-01	N/A	-	-	-	NO	NTX, IFD
58-89-9	Gamma-BHC (Lindane)	2.20		33.0	JN	ug/kg	RCDSS17101	4/131	0.100-200	33.0	N/A	520 (a)	490 C	RBC	NO	BSL, IFD
57-74-9	Alpha-Chlordane	2.40E-01	J	33.0	J	ug/kg	RCDSS17101	12/124	1.00-2,000	33.0	N/A	500[5] (b)	1,800[6] C	RBC	NO	BSL
57-74-9	Gamma-Chlordane	1.70E-01	J	63.0	JN	ug/kg	RCSSS16101	30/122	1.00-2,000	63.0	N/A	500[5] (b)	1600[6] C	RBC	NO	BSL
60-57-1	Dieldrin	1.90E-01	J	940	J	ug/kg	RCSTS88B1	22/114	0.200-390	940	N/A	42 (a)	40 C 40	RBC USEPA SSL	YES	ASL, FD
115-29-7	Endosulfan I	3.40		11.0	JN	ug/kg	RCSTS11A1	3/128	0.100-200	11.0	N/A	340,000[6] (a)	470,000[7] N 470,000[8]	RBC USEPA SSL	NO	BSL, IFD
115-29-7	Endosulfan II	2.00E-01	J	24.0	JN	ug/kg	RCSSS04101	9/130	0.200-390	24.0	N/A	340,000[6] (a)	470,000[7] N 470,000[8]	RBC USEPA SSL	NO	BSL
1031-07-8	Endosulfan Sulfate	4.20	JN	70.0	J	ug/kg	RCSTS10B1	16/117	0.200-390	70.0	N/A	-	-	-	YES	FD
72-20-8	Endrin	3.90	JN	150	J	ug/kg	RCSTS88A1	6/116	0.200-390	150	N/A	17,000 (a)	23000 N 23,000	RBC USEPA SSL	NO	BSL, IFD
7421-93-4	Endrin Aldehyde	3.60	J	65.0	JN	ug/kg	RSSS17101	15/61	3.40-49.0	65.0	N/A	-	-	-	YES	FD
53494-70-5	Endrin Ketone	4.30	JN	34.0	J	ug/kg	RCSSS08101	23/124	0.200-390	34.0	N/A	600 (b)	-	-	NO	BSL
76-44-8	Heptachlor	3.60		33.0		ug/kg	RCSTS86B1	4/130	0.100-200	33.0	N/A	160 (a)	140 C 100	RBC USEPA SSL	NO	BSL, IFD
1024-57-3	Heptachlor Epoxide	2.90	JN	83.0	J	ug/kg	RCSTS10B1	14/127	0.100-200	83.0	N/A	70 (b)	70 C	RBC	YES	ASL, FD
72-43-5	Methoxychlor	3.40E-01	J	670		ug/kg	RS-MW27-01	7/129	1.00-2,000	670	N/A	280,000 (a)	390000 N 390,000	RBC USEPA SSL	NO	BSL, IFD
53469-21-9	Aroclor 1242	1,900	J	1,900	J	ug/kg	RS-MW26-01	1/133	1.00-2,000	1,900	N/A	490 (a)	320 C 1,000	RBC USEPA SSL	YES	ASL, HIST
12672-29-6	Aroclor 1248	56.0	J	5,200	C	ug/kg	RS-SB26-01	7/133	1.00-2,000	5,200	N/A	490 (a)	320 C 1,000	RBC USEPA SSL	YES	ASL, HIST
11097-69-1	Aroclor 1254	190	J	6,600	J	ug/kg	RCSTS10D1	11/136	2.00-3,900	6,600	N/A	490 (a)	320 C 1,000	RBC USEPA SSL	YES	ASL, FD
11096-82-5	Aroclor 1260	200	J	5,600	J	ug/kg	RCSTS10D1	27/135	2.00-3,900	5,600	N/A	490 (a)	320 C 1,000	RBC USEPA SSL	YES	ASL, FD

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TABLE 28.1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Roebling Steel Company Superfund Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (10)	Background Value (2)	Screening Toxicity Value (3)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
7429-90-5	Aluminum	331	J	18,300		mg/kg	RS-SB09-01	66/66	-	18,300	N/A	7.82E+04 (c)	-	-	NO	NUT
7440-70-2	Calcium	198		343,000		mg/kg	RS-SB32-01	66/66	-	343,000	N/A	-	-	-	NO	NUT
7439-89-6	Iron	8,190	J	318,000		mg/kg	RS-SL2-0102	66/66	-	318,000	N/A	2.35E+04 (c)	-	-	NO	NUT
7439-95-4	Magnesium	172		107,000		mg/kg	RS-SB42-01	66/66	-	107,000	N/A	-	-	-	NO	NUT
7440-09-7	Potassium	21.5		3,020	J	mg/kg	RS-SB13-01	79/88	47.6-188	3,020	N/A	-	-	-	NO	NUT
7440-23-5	Sodium	14.7		1,690		mg/kg	RS-SB26-01	50/64	10.3-1,680	1,690	N/A	-	-	-	NO	NUT
7440-39-3	Barium	7.20		1,640	J	mg/kg	RCSSS18101	86/86	-	1,640	N/A	700 (a)	5.40E+03 N 5,500	RBC USEPA SSL	YES	ASL, FD
7439-96-5	Manganese	51.4	J	20,300		mg/kg	RS-DB01-01	79/79	-	20,300	N/A	11,000[7] (c)	-	-	YES	ASL, FD
7440-36-0	Antimony	8.90E-01	J	361	J	mg/kg	RCSSS18101	43/80	0.530-35,260	361	N/A	14 (a)	31 N 31	RBC USEPA SSL	YES	ASL, FD
7440-38-2	Arsenic	1.80		61.8		mg/kg	RS-SB26-02	72/72	-	61.8	N/A	20 (a)	0.43 C 0.4	RBC USEPA SSL	YES	ASL, FD
7440-41-7	Beryllium	1.00E-01		3.50		mg/kg	RS-SB09-01	46/83	0.020-14.7	3.50	N/A	1 (a)	160 N 0.1	RBC USEPA SSL	YES	ASL, FD
7440-43-9	Cadmium	3.70E-01		390	J	mg/kg	RS-MW20-01	66/64	0.200-4.50	390	N/A	1 (a)	78[8] N 78	RBC USEPA SSL	YES	ASL, FD
7440-47-3	Chromium	7.70		1,440	J	mg/kg	RS-DB01-01	86/86	-	1,440	N/A	390 (b)	390[9] N	RBC	YES	ASL, FD
7440-48-4	Cobalt	1.00		60.4	J	mg/kg	RS-MW8D-01	83/85	2.10-58.7	60.4	N/A	4,700 (c)	-	-	NO	BSL
7440-50-8	Copper	12.2	J	9,960		mg/kg	RS-SB26-01	81/81	-	9,960	N/A	600 (a)	3100 N	RBC	YES	ASL, FD
7439-92-1	Lead	13.4	J	69,000		mg/kg	RS-SB42-01	84/85	55,900	69,000	N/A	400 (a)	400	USEPA SSL	YES	ASL, FD
7439-97-6	Mercury	9.00E-02	J	13.2		mg/kg	RCSSS18101	35/78	0.060-0.150	13.2	N/A	14 (a)	23[10] N 23	RBC USEPA SSL	NO	BSL
7440-02-0	Nickel	3.70		663	J	mg/kg	RS-MWD1-01	85/85	-	663	N/A	250 (a)	1600 N 1,600	RBC USEPA SSL	YES	ASL, FD
7782-49-2	Selenium	2.50E-01	J	2.70	J	mg/kg	RS-SB26-01	24/65	0.210-4.40	2.70	N/A	63 (a)	390 N 390	RBC USEPA SSL	NO	BSL
7440-22-4	Silver	5.50E-01		36.3		mg/kg	RS-MW20-01	25/79	0.190-4.60	36.3	N/A	110 (a)	390 N 390	RBC USEPA SSL	NO	BSL
7440-28-0	Thallium	3.10E-01		4.40		mg/kg	RCSSS14101	7/85	0.230-1.40	4.40	N/A	2 (a)	5.5 N	RBC	YES	ASL, FD
7440-62-2	Vanadium	4.20		128		mg/kg	RS-SB16-01	60/66	5.50-6.40	128	N/A	370 (a)	550 N 550	RBC USEPA SSL	NO	BSL

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TABLE 28.1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Roebling Steel Company Superfund Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil

CAS Number	Chemical	(1) Minimum Concentration	Minimum Qualifier	(1) Maximum Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (10)	(2) Background Value	(3) Screening Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	(4) Rationale for Contaminant Deletion or Selection
7440-66-6	Zinc	49.5		118,000	J	mg/kg	RS-DB02-01	85/88	874	118,000	N/A	1,600 (a)	23000 N 23,000	RBC USEPA SSL	YES	ASL, FD

(1) Minimum/maximum detected concentration.
(2) N/A - Not Applicable; no background data available
(3) Screening Toxicity Value = Values used are, in order of precedence:
a) New Jersey Soil Cleanup Criteria
b) United States Environmental Protection Agency Soil Screening Levels
c) Risk-Based Concentration for residential land use.

(4) Rationale Codes Selection Reason: Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Above Screening Levels (ASL)
Deletion Reason: Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Levels- Both RBCs and potential ARAR/TBC values are used (BSL)

(5) Criteria for chlordane.
(6) Criteria for endosulfan.
(7) Screening Toxicity Value (RBC) is for the 'food' form of manganese.
(8) Screening Toxicity Value (RBC) is for the 'food' form of cadmium.
(9) Screening Toxicity Value (RBC) is for chromium VI.
(10) Concentration Used for Screening = Maximum Concentration.
(11) Screening Toxicity Value (RBC) is for the Mercuric chloride.

Sources:
NJDEP, June 1996. *Guidance Document for the Remediation of Contaminated Soils*.
USEPA: Office of Emergency and Remedial Response, July 1996a. *Soil Screening Guidance: Technical Background Document*.
USEPA: EPA Region III, April 1996b. *EPA Region III Risk-Based Concentrations*.

Definitions:
- = Not Applicable/Not Available
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered

JN = Presumptively Present
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic
NJ SCC = New Jersey Soil Cleanup Criteria
USEPA SSL = United States Environmental Protection Agency Soil Screening Levels
RBC = EPA Region III Risk-Based Concentrations

TABLE 29.2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Subsurface Soil

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
74-87-3	Chloromethane	3.00	J	160	J	µg/kg	RS-MW05-04	26/111		160	N/A	620,000 (a)	49000 C	RBC	NO	BSL
75-00-3	Chloroethane	4.00	J	4.00	J	µg/kg	RS-SB26-03	1/119		4.00	N/A	220,000 (C)	-	-	NO	BSL, IFD
75-01-4	Vinyl Chloride	16.0	J	16.0	J	µg/kg	RS-SB17-03	1/119		16.0	N/A	2,000 (a)	340 C	RBC	NO	BSL, IFD
													300	USEPA SSL		
74-87-3	Methylene Chloride	2.00	JB	230		µg/kg	RSS-BH-008-197	25/25		230	N/A	49,000 (a)	85000 C	RBC	NO	BSL
540-59-0	1,2-Dichloroethene (total)	2.00	J	2.00	J	µg/kg	RSS-MW-009-105	1/1		2.00	N/A	700,000 (C)	-	-	NO	BSL
71-55-6	1,1,1-Trichloroethane	1.00	J	65.0		µg/kg	RSS-MW-008-101	19/125		65.0	N/A	210,000 (a)	1.6E+06 N	RBC	NO	BSL
79-01-6	Trichloroethene	1.00	J	34.0	J	µg/kg	RS-SB18-03	11/122		34.0	N/A	23,000 (a)	58000 C	RBC	NO	BSL
													12,000	USEPA SSL		
79-34-5	1,1,2,2-Tetrachloroethane	5.00	J	5.00	J	µg/kg	RSS-BH-026-157	1/106		5.00	N/A	34,000 (a)	3200 C	RBC	NO	BSL, IFD
127-18-4	Tetrachloroethene	1.00	J	40.0		µg/kg	RSS-MW-008-100	20/114		40.0	N/A	4,000 (a)	12000 C	RBC	NO	BSL
													12,000	USEPA SSL		
56-23-5	Carbon Tetrachloride	2.00	J	4.00	J	µg/kg	RS-SB22-03	5/118		4.00	N/A	2,000 (a)	4900 C	RBC	NO	BSL, IFD
													5,000	USEPA SSL		
75-27-4	Bromodichloromethane	3.00	J	6.00		µg/kg	RS-DB01-08	3/118		6.00	N/A	11,000 (a)	10000 C	RBC	NO	BSL, IFD
													10,000	USEPA SSL		
67-66-3	Chloroform	1.00	J	62.0	J	µg/kg	RS-SB26-03	20/122		62.0	N/A	19,000 (a)	100000 C	RBC	NO	BSL
													100,000	USEPA SSL		
71-43-2	Benzene	1.00	J	8.00		µg/kg	RSS-MW-008-100	17/129		8.00	N/A	3,000 (a)	22000 C	RBC	NO	BSL
													800	USEPA SSL		
108-88-3	Toluene	0.20	J	420	J	µg/kg	RS-MW24D-03	107/159		420	N/A	1.00E+06 (a)	1.56E+07 N	RBC	NO	BSL
													1.60E+07	USEPA SSL		
100-41-4	Ethylbenzene	1.00	J	25.0		µg/kg	RSS-MW-013-096	7/110		25.0	N/A	1.00E+06 (a)	7.82E+06 N	RBC	NO	BSL
													7.80E+06	USEPA SSL		
1330-20-7	Xylene (total)	1.00	J	53.0	J	µg/kg	RS-SL2-0307	13/109		53.0	N/A	410,000 (a)	1.56E+08 N	RBC	NO	BSL
													1.60E+08	USEPA SSL		
108-90-7	Chlorobenzene	1.00	J	69.0		µg/kg	RS-DB01-06	19/114		69.0	N/A	37,000 (a)	1.56E+06 N	RBC	NO	BSL
													1.60E+06	USEPA SSL		
75-15-0	Carbon Disulfide	1.00	J	59.0		µg/kg	RS-SL1-0205	13/122		59.0	N/A	7.80E+06 (b)	7.83E+06 N	USEPA SSL	NO	BSL
108-05-4	Vinyl Acetate	8.00	J	22.0	B	µg/kg	RSS-MW-005-081	4/109		22.0	N/A	7.80E+07 (b)	7.80E+07 N	USEPA SSL	NO	BSL, IFD

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TABLE 28.2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Subsurface Soil

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
67-64-1	Acetone	6.00	JB	19,000		µg/kg	RSS-BH-009-116	29/123		19,000	N/A	1.00E+06 (a)	7.8E+06 N 7.80E+06	RBC USEPA SSL	NO	BSL
78-93-3	2-Butanone	1.00	J	260		µg/kg	RSS-BH-012-138	29/113		260	N/A	1.00E+06 (a)	4.69E+07 N	RBC	NO	BSL
591-78-6	2-Hexanone	1.40	J	1.40	J	µg/kg	RSS-BH-006-197	1/108		1.40	N/A	3.10E+06 (C)	-	-	NO	BSL, IFD
108-95-2	Phenol	59.0	J	330	J	µg/kg	RSS-BH-027-163	2/2		330	N/A	1.00E+07 (a)	4.69E+07 N 4.70E+07	RBC USEPA SSL	NO	BSL
106-44-5	4-Methylphenol	65.0	J	240	J	µg/kg	RSS-BH-017-043	2/2		240	N/A	2.80E+06 (a)	391071 N	RBC	NO	BSL
58-90-2	2,3,4,6-tetrachlorophenol	2.00	J	2.00	J	µg/kg	RS-DB02-04	1/13		2.00	N/A	2.3E+06 N (C)	-	-	NO	BSL
59-50-7	4-Chloro-3-Methylphenol	150	J	150	J	µg/kg	RSS-BH-020-126	1/117		150	N/A	-	1.00E+07	NJ SCC	NO	BSL, IFD
84-66-2	Diethylphthalate	36.0	J	510	J	µg/kg	RS-MW29-01	5/117		510	N/A	1.00E+07 (a)	6.3E+07 N 6.30E+07	RBC USEPA SSL	NO	BSL, IFD
84-74-2	Di-n-butylphthalate	23.0	J	1,600		µg/kg	RSS-BH-026-187	24/130		1,600	N/A	5.70E+06 (a)	7.8E+06 N	RBC	NO	BSL
85-68-7	Butyl Benzyl Phthalate	200	J	880	J	µg/kg	RS-MW29-01	2/118		880	N/A	1.10E+06 (a)	1.6E+07 N 1.60E+07	RBC USEPA SSL	NO	BSL, IFD
117-84-0	Di-n-octylphthalate	32.0	J	1,200	J	µg/kg	RS-MW29-01	5/115		1,200	N/A	1.10E+06 (a)	1.56E+06 N 1.60E+06	RBC USEPA SSL	NO	BSL, IFD
111-44-4	bis(2-Ethylhexyl)phthalate	33.0	J	9,300	J	µg/kg	RS-DB02-08	45/145		9,300	N/A	49,000 (a)	46000 C 46,000	RBC USEPA SSL	NO	BSL
86-30-6	N-nitrosodiphenylamine (1)	60.0	J	60.0	J	µg/kg	RSS-BH-016-144	1/117		60.0	N/A	140,000 (a)	130000 C 130,000	RBC USEPA SSL	NO	BSL, IFD
78-83-1	Isobutanol	4.00	J	4.00	J	µg/kg	RS-DB04-04	1/1		4.00	N/A	2.30E+07 (C)	-	-	NO	BSL
78-59-1	Isophorone	36.0	J	36.0	J	µg/kg	RSS-MW-016-020	1/117		36.0	N/A	1.10E+08 (a)	670000 C 6.70E+05	RBC USEPA SSL	NO	BSL, IFD
108-10-1	4-Methyl-2-Pentanone	2.00	J	49.0		µg/kg	RSS-MW-003-069	9/112		49.0	N/A	1.00E+08 (a)	6.30E+06 N	RBC	NO	BSL
65-85-0	Benzoic acid	74.0	J	6,000		µg/kg	RS-SB29-03	14/116		6,000	N/A	3.10E+08 (b)	3.10E+08 N	USEPA SSL	NO	BSL
106-46-7	1,4-Dichlorobenzene sv	2.00	BJN	3.00	JN	µg/kg	RS-DB01-04	2/2		3.00	N/A	570,000 (a)	27000 N 27,000	RBC NJ SCC	NO	BSL
132-64-9	Dibenzofuran	39.0	J	1,200		µg/kg	RSS-MW-003-069	20/121		1,200	N/A	310,000 (C)	-	-	NO	BSL
91-20-3	Naphthalene sv	23.0	J	2,100		µg/kg	RSS-BH-017-043	30/123		2,100	N/A	230,000 (a)	3.10E+06 N 3.10E+06	RBC USEPA SSL	NO	BSL

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TABLE 2B.2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Subsurface Soil

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
91-57-6	2-Methylnaphthalene	46.0	J	19,000		µg/kg	RSS-BH-026-025	35/121		19,000	N/A	3.10E+06 (C)	-	-	NO	BSL
83-32-9	Acenaphthene	28.0	J	580		µg/kg	RS-DB04-05	13/118		580	N/A	3.40E+06 (a)	4.7E+06 N 4.70E+06	RBC USEPA SSL	NO	BSL
208-96-8	Acenaphthylene	34.0	J	1,100		µg/kg	RSS-MW-003-069	11/122		1,100	N/A	-	-	-	YES	FD
120-12-7	Anthracene	27.0	J	2,700		µg/kg	RSS-MW-003-069	39/131		2,700	N/A	1.00E+07 (a)	2.3E+07 N 2.30E+07	RBC USEPA SSL	NO	BSL
56-55-3	Benzo(a)anthracene	47.0	J	4,200		µg/kg	RSS-MW-003-069	53/133		4,200	N/A	900 (a)	880 C 900	RBC USEPA SSL	YES	ASL, FD
50-32-8	Benzo(a)pyrene	41.0	J	3,800		µg/kg	RSS-MW-003-069	58/133		3,800	N/A	660 (a)	88 C 90	RBC USEPA SSL	YES	ASL, FD
205-99-2	Benzo(b)fluoranthene	31.0	J	4,600		µg/kg	RS-DB04-05	55/128		4,600	N/A	900 (a)	880 C 900	RBC USEPA SSL	YES	ASL, FD
191-24-2	Benzo(g,h,i)perylene	45.0	J	1,700		µg/kg	RS-SB24-03	32/122		1,700	N/A	-	-	-	YES	FD
207-08-9	Benzo(k)fluoranthene	67.0	J	2,700	J	µg/kg	RS-SL2-0307	34/116		2,700	N/A	900 (a)	8800 C 9,000	RBC USEPA SSL	YES	ASL, FD
218-01-9	Chrysene	42.0	J	4,300		µg/kg	RSS-MW-003-069	64/137		4,300	N/A	9,000 (a)	88000 C 88,000	RBC USEPA SSL	NO	BSL
53-70-3	Dibenzo(a,h)anthracene	39.0	J	610		µg/kg	RS-DB04-05	17/118		610	N/A	660 (a)	88 C 90	RBC USEPA SSL	YES	ASL, FD
206-44-0	Fluoranthene	31.0	J	9,800		µg/kg	RSS-MW-003-069	62/136		9,800	N/A	2.30E+06 (a)	3.1E+06 N 3.10E+06	RBC USEPA SSL	NO	BSL
86-73-7	Fluorene	41.0	J	1,400		µg/kg	RSS-MW-003-069	19/121		1,400	N/A	2.30E+06 (a)	3.1E+06 N 3.10E+06	RBC USEPA SSL	NO	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	51.0	J	2,500		µg/kg	RSS-MW-003-069	36/127		2,500	N/A	900 (a)	880 C 900	RBC USEPA SSL	YES	ASL, FD
85-01-8	Phenanthrene	36.0	J	11,000		µg/kg	RSS-MW-003-069	84/135		11,000	N/A	-	-	-	YES	FD
129-00-0	Pyrene	29.0	J	8,300		µg/kg	RSS-MW-003-069	72/144		8,300	N/A	1.70E+06 (a)	2.3E+06 N 2.30E+06	RBC USEPA SSL	NO	BSL
309-00-2	Aldrin	10.0		50.0		µg/kg	RS-SB05-04	3/118		50.0	N/A	40 (a)	38 C 40	RBC USEPA SSL	YES	ASL, HIST

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TABLE 28.2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Subsurface Soil

CAS Number	Chemical	(1) Minimum Concentration	Minimum Qualifier	(1) Maximum Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	(2) Background Value	(3) Screening Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	(4) Rationale for Contaminant Deletion or Selection
319-85-7	Beta-bhc	30.0		190	JN	µg/kg	RS-DB04-05	5/118		190	N/A	400 (b)	350 C	USEPA SSL	NO	BSL
57-74-9	Gamma-chlordane	14.0	J	14.0	J	µg/kg	RS-MW24S-03	1/109		14.0	N/A	500[f] (b)	1600[f] C	USEPA SSL	NO	BSL, IFD
1024-57-3	Heptachlor Epoxide	6.00	J	31.0	J	µg/kg	RS-MW24D-04	3/119		31.0	N/A	70 (b)	70 C	USEPA SSL	NO	BSL, IFD
115-29-7	Endosulfan I	6.60	J	17.0	J	µg/kg	RS-MW24D-04	2/119		17.0	N/A	340,000[f] (a)	470,000[f] N 470,000[f]	RBC USEPA SSL	NO	BSL, IFD
53494-70-5	Endrin Ketone	22.0	J	61.0	J	µg/kg	RS-MW24D-04	2/120		61.0	N/A	-	-	-	NO	NTX, IFD
60-57-1	Dieldrin	1.80		1.80		µg/kg	RSS-BH-007-175	1/118		1.80	N/A	42 (a)	40 C 40	RBC USEPA SSL	NO	BSL, IFD
72-43-5	Methoxychlor	190		190		µg/kg	RS-SB07-03	1/120		190	N/A	280,000 (a)	390000 N 390,000	RBC USEPA SSL	NO	BSL, IFD
53469-21-9	Aroclor 1242	110	J	3,100	J	µg/kg	RS-SB14-04	8/120		3,100	N/A	490 (a)	320 C 1,000	RBC USEPA SSL	YES	ASL, FD
11096-82-5	Aroclor 1260	190	J	190	J	µg/kg	RS-SB08-04	1/120		190	N/A	490 (a)	320 C 1,000	RBC USEPA SSL	NO	BSL, IFD
7429-90-5	Aluminum	74.9		12,900		mg/kg	RS-MWD5-06	126/127		12,900	N/A	78,000 (C)	-	-	NO	NUT
7440-70-2	Calcium	37.9		113,000		mg/kg	RS-MW25-06	115/155		113,000	N/A	-	-	-	NO	NUT
7439-89-6	Iron	149		376,000		mg/kg	RS-SL2-0109	130/130		376,000	N/A	23,000 (C)	-	-	NO	NUT
7439-95-4	Magnesium	22.9		49,800		mg/kg	RS-MW24D-03	111/117		49,800	N/A	-	-	-	NO	NUT
7440-09-7	Potassium	19.8		3,000		mg/kg	RS-MW27-05	96/114		3,000	N/A	-	-	-	NO	NUT
7440-23-5	Sodium	23.4		2,760		mg/kg	RS-MW28-03	67/112		2,760	N/A	-	-	-	NO	NUT
7440-39-3	Barium	9.20E-01		818		mg/kg	RS-DB02-04	114/118		818	N/A	700 (a)	5475 N 5,500	RBC USEPA SSL	YES	ASL, FD
7439-96-5	Manganese	2.30		26,500		mg/kg	RS-MW26-06	124/124		26,500	N/A	11,000[m] (C)	-	-	YES	ASL, FD
7440-36-0	Antimony	2.60		36.2	J	mg/kg	RS-MW8D-06	36/107		36.2	N/A	14 (a)	31 N 31	RBC USEPA SSL	YES	ASL, FD
7440-38-2	Arsenic	9.30E-01		79.9		mg/kg	RS-MW21-04	108/115		79.9	N/A	20 (a)	0.43 C 0.4	RBC USEPA SSL	YES	ASL, FD
7440-41-7	Beryllium	2.20E-01		4.60		mg/kg	RSS-BH-028-168	51/111		4.60	N/A	1 (a)	160 N 0.1	RBC USEPA SSL	YES	ASL, FD
7440-43-9	Cadmium	4.80E-01		112		mg/kg	RS-SL2-0109	28/110		112	N/A	1 (a)	78[f] N	RBC	YES	ASL, FD

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TABLE 28.2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Subsurface Soil

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
7440-47-3	Chromium	2.00	J	536	J	mg/kg	RS-SB10-03	117/124		536	N/A	390	(b)	78 390[illegible] N	USEPA SSL USEPA SSL	YES	ASL, FD
7440-48-4	Cobalt	7.60E-01		38.5		mg/kg	RS-SL1-0107	95/112		38.5	N/A	4,700	(C)	-	-	NO	BSL
7440-50-8	Copper	1.40		8,080	J	mg/kg	RS-MW24D-05	115/115		8,080	N/A	600	(a)	3100 N	RBC	YES	ASL, FD
7439-92-1	Lead	8.30E-01		90,600		mg/kg	RS-SB42-03	124/124		90,600	N/A	-		400 400	NJ SCC USEPA SSL	YES	ASL, FD
7439-97-6	Mercury	7.00E-02		15.2		mg/kg	RS-MW24D-04	31/108		15.2	N/A	14	(a)	23 N 23	RBC USEPA SSL	YES	ASL, FD
7440-02-0	Nickel	1.20	J	289	J	mg/kg	RS-SL1-0107	88/115		289	N/A	250	(a)	1600 N 1,600	RBC USEPA SSL	YES	ASL, FD
7782-49-2	Selenium	2.40E-01		3.50	J	mg/kg	RS-MW24D-05	18/73		3.50	N/A	63	(a)	390 N 390	RBC USEPA SSL	NO	BSL
7440-22-4	Silver	9.20E-01	J	67.3	J	mg/kg	RS-SB42-03	8/102		67.3	N/A	110	(a)	390 N 390	RBC USEPA SSL	YES	ASL, FD
7440-28-0	Thallium	2.30E-01		9.40E-01		mg/kg	RS-SB36-04	12/106		9.40E-01	N/A	2	(a)	6.5 N	RBC	YES	ASL, FD
7440-62-2	Vanadium	1.70		594		mg/kg	RS-MW25-06	108/121		594	N/A	370	(a)	550 N 550	RBC USEPA SSL	YES	ASL, FD
7440-66-6	Zinc	7.10		13,100	J	mg/kg	RS-SB06-03	111/112		13,100	N/A	1,600	(a)	23000 N 23,000	RBC USEPA SSL	YES	ASL, FD

(1) Minimum/maximum detected concentration
(2) N/A - Refer to supporting information for background discussion.
(3) Screening Toxicity Value = Values used are, in order of precedence:
a) New Jersey Soil Cleanup Criteria
b) United States Environmental Protection Agency Soil Screening Levels
c) Risk-Based Concentration for residential land use.
(4) Rationale Codes Selection Reason: Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)

Definitions:
- = Not Applicable/Not Available
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
JN = Presumptively Present
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic
NJ SCC = New Jersey Soil Cleanup Criteria
USEPA SSL = United States Environmental Protection Agency Soil Screening Levels
RBC = EPA Region III Risk-Based Concentrations

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TABLE 28.2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Subsurface Soil

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)

Deletion Reason: Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Levels- Both RBCs and potential ARAR/TBC values are used (BSL)

(5) Criteria for chlordane.
(6) Criteria for endosulfan.
(7) Screening Toxicity Value (RBC) is for the 'food' form of manganese.
(8) Screening Toxicity Value (RBC) is for the 'food' form of cadmium.
(9) Screening Toxicity Value (RBC) is for chromium VI.
(10) Concentration Used for Screening = Maximum Concentration.

Sources:
NJDEP; June 1998. *Guidance Document for the Remediation of Contaminated Soils*.
USEPA: Office of Emergency and Remedial Response, July 1996a. *Soil Screening Guidance: Technical Background Document*.
USEPA: EPA Region III, April 1998b. *EPA Region III Risk-Based Concentrations*.

TABLE 28.3
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Roebling Steel Company Superfund Site

Scenario Timeframe: Current/Future
Medium: Delaware River Sediment
Exposure Medium: Sediment
Exposure Point: Sediment

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
108-95-2	Phenol	69.0	J	69.0	J	ug/kg	RCSSD2001	1/13	420-940	69.0	-	1.00E+07 (a)	4.69E+07 N 4.70E+07	RBC USEPA SSL	NO	BSL
106-44-5	4-methylphenol	70.0	J	340	J	ug/kg	RS-SD-301	12/15	420-880	340	64-170	2.80E+06 (a)	391000 N	RBC	NO	BSL
84-66-2	Diethylphthalate	46.0	J	52.0	J	ug/kg	RCSSD2201	2/16	420-940	52.0	-	1.00E+07 (a)	6.30E+07 N 6.30E+07	RBC USEPA SSL	NO	BSL
84-74-2	Di-n-butylphthalate	72.0	J	180	J	ug/kg	RS-SD-601	3/13	420-820	180	-	5.70E+06 (a)	7.8E+06 N	RBC	NO	BSL
85-68-7	Butylbenzylphthalate	81.0	J	400	J	ug/kg	RCSSD2301	5/15	460-820	400	70-110	1.10E+06 (a)	1.6E+07 N 1.60E+07	RBC USEPA SSL	NO	BSL
117-84-0	Di-n-octylphthalate	53.0	J	53.0	J	ug/kg	RCSSD2201	1/13	420-820	53.0	-	1.10E+06 (a)	1.56E+06 N 1.60E+06	RBC USEPA SSL	NO	BSL
111-44-4	Bis(2-ethylhexyl) Phthalate	480	J	6,600	J	ug/kg	RCSSD2001	14/16	420-1,500	6,600	1,200-1,400	49,000 (a)	46000 C 46,000	RBC USEPA SSL	NO	BSL
86-74-8	Carbazole	61.0	J	66.0	J	ug/kg	RCSSD2401	2/10	420-820	66.0	-	32,000 (b)	32000 C	USEPA SSL	NO	BSL
91-20-3	Naphthalene sv	49.0	J	96.0	J	ug/kg	RCSSD2401	11/16	420-890	96.0	58-60	230,000 (a)	3.10E+06 N 3.10E+06	RBC USEPA SSL	NO	BSL
91-57-6	2-Methylnaphthalene	42.0	J	71.0	J	ug/kg	RCSSD2401	6/16	420-940	71.0	-	3.10E+06 N (C)	-	-	NO	BSL
132-64-9	Dibenzofuran	32.0	J	54.0	J	ug/kg	RCSSD2401	2/16	420-940	54.0	-	310000 N (C)	-	-	NO	BSL
83-32-9	Acenaphthene	45.0	J	45.0	J	ug/kg	RCSSD2201	1/16	420-940	45.0	-	3.40E+06 (a)	4.7E+07 N 4.70E+08	RBC USEPA SSL	NO	BSL
208-96-8	Acenaphthylene	45.0	J	190	J	ug/kg	RCSSD2401	7/16	420-890	190	-	-	-	-	YES	FD
120-12-7	Anthracene	51.0	J	340	J	ug/kg	RCSSD2401	9/13	420-880	340	-	1.00E+07 (a)	2.3E+07 N 2.30E+07	RBC USEPA SSL	NO	BSL
56-55-3	Benzo[a]anthracene	200	J	850	J	ug/kg	RCSSD2401	12/13	420	850	35-570	900 (a)	880 C 900	RBC USEPA SSL	NO	BSL
50-32-8	Benzo(a)pyrene	230	J	940	J	ug/kg	RCSSD2401	12/13	420	940	40-620	660 (a)	88 C 90	RBC USEPA SSL	YES	ASL, FD
205-99-2	Benzo[b]fluoranthene	45.0	J	1,000	J	ug/kg	RS-SD-701	12/13	690	1,000	300-630	900 (a)	880 C 900	RBC USEPA SSL	YES	ASL, FD
191-24-2	Benzo(g,h,i)perylene	80.0	J	550	J	ug/kg	RCSSD2401	11/13	420-830	550	23-350	-	-	-	YES	FD
207-08-9	Benzo(k)fluoranthene	39.0	J	1,000	J	ug/kg	RS-SD-701	11/12	920	1,000	230-660	900 (n)	8800 C	RBC	YES	ASL, FD
218-01-9	Chrysene	65.0	J	1,000	J	ug/kg	RCSSD2401	13/13	-	1,000	42-680	9,000 (a)	88000 C	RBC	NO	BSL
53-70-3	Dibenzo(a,h)anthracene	73.0	J	230	J	ug/kg	RCSSD2401	6/13	420-800	230	-	660 (a)	88 C 90	RBC USEPA SSL	YES	ASL, FD

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TABLE 28.3
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Roebling Steel Company Superfund Site

Scenario Timeframe: Current/Future
Medium: Delaware River Sediment
Exposure Medium: Sediment
Exposure Point: Sediment

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
206-44-0	Fluoranthene	72.0	J	1,600	J	ug/kg	RCSSD2401	13/13	-	1,600	67-1,100	2.30E+06 (a)	3.1E+06 N 3.10E+06	RBC USEPA SSL	NO	BSL
86-73-7	Fluorene	48.0	J	110	J	ug/kg	RCSSD2401	4/16	420-940	110	-	2.30E+05 (a)	3.1E+06 N 3.10E+06	RBC USEPA SSL	NO	BSL
193-39-5	Indeno[1,2,3-cd]pyrene	74.0	J	560	J	ug/kg	RCSSD2401	12/13	420	560	24-350	900 (a)	880 C 900	RBC USEPA SSL	NO	BSL
85-01-8	Phenanthrene	72.0	J	830	J	ug/kg	RCSSD2401	15/16	800	830	27-460	-	-	-	YES	FD
129-00-0	Pyrene	100	J	1,500	J	ug/kg	RCSSD2401	12/13	690	1,500	50-1,000	1.70E+06 (a)	2.3E+06 N 2.30E+06	RBC USEPA SSL	NO	BSL
72-54-8	4,4'-DDE	6.90	J	47.0		ug/kg	RS-SD-601	14/16	4.20-22.0	47.0	6.6-13	2,000 (a)	1900 C 2,000	RBC USEPA SSL	NO	BSL
72-55-9	4,4'-DDD	4.50	J	19.0		ug/kg	RCSSD2501	6/15	4.20-31.0	19.0	8.4-20	3,000 (a)	2700 C 3,000	RBC USEPA SSL	NO	BKG, BSL
50-29-3	4,4'-DDT	5.40	J	35.0		ug/kg	RS-SD-601	8/16	4.20-31.0	35.0	110-250	2,000 (a)	1900 C 2,000	RBC USEPA SSL	NO	BKG, BSL
319-84-6	alpha-BHC	1.70	J	1.70	J	ug/kg	RCSSD4701	1/16	2.20-16.0	1.70	-	100 (b)	110 C	USEPA SSL	NO	BSL
58-89-9	gamma-BHC (Lindane)	4.60E-01	J	4.60E-01	J	ug/kg	RCSSD2901	1/16	2.20-16.0	4.60E-01	-	520 (a)	490 C	RBC	NO	BSL
57-74-9	alpha-Chlordane	3.30	J	3.70	J	ug/kg	RCSSD2501	2/15	2.20-330	3.70	2.3-4.6	500[5] (b)	1800 C[5]	USEPA SSL	NO	BKG
60-57-1	Dieldrin	6.60E-01	J	6.60E-01	J	ug/kg	RCSSD2601	1/16	3.30-31.0	6.60E-01	-	42 (a)	40 C 40	RBC USEPA SSL	NO	BSL
1031-07-8	Endosulfan sulfate	6.60	J	12.0		ug/kg	RCSSD2101	3/15	4.20-31.0	12.0	-	-	-	-	YES	FD
72-20-8	Endrin	6.50	J	12.0		ug/kg	RCSSD2501	5/16	4.20-31.0	12.0	-	17,000 (a)	23000 N 23,000	RBC USEPA SSL	NO	BSL
7421-36-3	Endrin aldehyde	4.70	JN	28.0		ug/kg	RCSSD2601	4/13	3.90-9.40	28.0	27-31	-	- 500	- USEPA SSL	NO	BKG
57-74-9	gamma-Chlordane	9.80E-01	J	4.90	JN	ug/kg	RCSSD2401	6/16	2.20-160	4.90	1.6-4.7	500[5] (b)	1800 C[5]	USEPA SSL	NO	BSL
76-44-8	Heptachlor	8.30E-01	J	5.80	J	ug/kg	RCSSD2401	3/15	2.20-16.0	5.80	-	150 (a)	140 C 100	RBC USEPA SSL	NO	BSL
11097-69-1	Aroclor-1254	13.0	JN	120	JN	ug/kg	RCSSD2501	11/16	80.0-310	120	-	490 (a)	320 C 1,000	RBC USEPA SSL	NO	BSL
7429-90-5	Aluminum	2,710		18,600	J	ug/kg	RCSSD2801	17/17	-	18,600	4.67E+06-2.03E+07	7.8E+07 N	-	-	NO	NUT
7440-70-2	Calcium	1,390	J	5,890	J	ug/kg	RS-SD-501	17/17	-	5,890	828,000-5.99E+06	-	-	-	NO	NUT
7439-89-6	Iron	31,200		301,000		ug/kg	RCSSD2701	17/17	-	301,000	1.58E+06-3.44E+06	2.3E+07 N	-	-	NO	NUT

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TABLE 28.3
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Roebling Steel Company Superfund Site

Scenario Timeframe: Current/Future
Medium: Delaware River Sediment
Exposure Medium: Sediment
Exposure Point: Sediment

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
7439-95-4	Magnesium	1,500	J	4,900	J	ug/kg	RCSSD2801	17/17	-	4,900	1.82E+06-4.81E+06	-	-	-	NO	NUT
7440-09-7	Potassium	345		2,260	J	ug/kg	RCSSD2801	17/17	-	2,260	648,000-2.38E+06	-	-	-	NO	NUT
7440-23-5	Sodium	65.7	J	798	J	ug/kg	RCSSD2501	13/17	468-1,040	798	22,600-150,000	-	-	-	NO	NUT
7440-39-3	Barium	58.1		182	J	ug/kg	RS-SD-701	17/17	-	182	32,500-174,000	700,000 (a)	5.5E+06 N	RBC	NO	BKG
													5,500,000	USEPA SSL		
7439-96-5	Manganese	540	J	1,900		ug/kg	RCSSD2701	17/17	-	1,900	201,000-1.19E+06	1.1E+07 N (C)	-	-	NO	BKG
7440-36-0	Antimony	9.50E-01	J	146	J	ug/kg	RS-SD-601	4/17	1.00-27.6	146	-	14,000 (a)	31000 N	RBC	NO	BSL
													31,000	USEPA SSL		
7440-38-2	Arsenic	5.30		76.0		ug/kg	RCSSD2701	17/17	-	76.0	2,000-8,200	20,000 (a)	430 C	RBC	NO	BKG
													400	USEPA SSL		
7440-41-7	Beryllium	1.20		8.00	J	ug/kg	RS-SD-701	17/17	-	8.00	470-2,400	1,000 (a)	160000 N	RBC	NO	BKG
													100	USEPA SSL		
7440-43-9	Cadmium	3.10	J	10.8	J	ug/kg	RS-SD-701	12/12	-	10.80	3,400-7,100	1,000 (a)	78000 N[3a]	RBC	NO	BKG
													78,000	USEPA SSL		
7440-47-3	Chromium	32.2		203		ug/kg	RCSSD2701	17/17	-	203	11,400-46,200	390,000 (b)	390000 N[3b]	USEPA SSL	NO	BKG
7440-48-4	Cobalt	12.2		32.7		ug/kg	RS-SD-601	17/17	-	32.7	7,600-24,300	4.7E+06 N (C)	-	-	NO	BKG
7440-50-8	Copper	47.5	J	475	J	ug/kg	RS-SD-601	17/17	-	475	14,900-76,600	600,000 (a)	3.1E+06 N	RBC	NO	BKG
7439-92-1	Lead	79.2		1,060	J	ug/kg	RS-SD-501	17/17	-	1,060	33,300-83,600	-	400,000	NJ SCC	NO	BKG
													400,000	USEPA SSL		
7439-97-6	Mercury	1.70E-01	J	8.00E-01	J	ug/kg	RS-SD-701	8/17	0.070-0.260	8.00E-01	180-290	14,000 (a)	23000 N	RBC	NO	BKG
											16,900-34,300		23,000	USEPA SSL	NO	BKG
7440-02-0	Nickel	23.5		150		ug/kg	RCSDD2701	17/17	-	150		250,000 (a)	1.6E+06 N	RBC	NO	BKG
													1,600,000	USEPA SSL		
7782-49-2	Selenium	4.90E-01	J	3.20	J	ug/kg	RCSSD3201	7/17	0.680-7.90	3.20	330-790	63,000 (a)	390000 N	RBC	NO	BKG
													390,000	USEPA SSL		
7440-22-4	Silver	1.70		5.90	J	ug/kg	RCSSD2501	10/17	1.30-2.80	5.90	-	110,000 (a)	390000 N	RBC	NO	BSL
													390,000	USEPA SSL		
7440-28-0	Thallium	1.90	J	1.90	J	ug/kg	RCSSD2801	1/16	0.680-7.90	1.90	640-1,500	2,000 (a)	5500 N	RBC	NO	BKG
7440-62-2	Vanadium	17.9		43.0	J	ug/kg	RS-SD-501	17/17	-	43.0	8,700-37,100	370,000 (a)	550000 N	RBC	NO	BKG
													550,000	USEPA SSL		

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TABLE 28.3
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Roebling Steel Company Superfund Site

Scenario Timeframe: Current/Future
Medium: Delaware River Sediment
Exposure Medium: Sediment
Exposure Point: Sediment

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
7440-66-6	Zinc	378		7,720	J	ug/kg	RCSSD2501	17/17	-	7,720	182,000-603,000	1.50E+06 (a)	2.3E+07 N 2.30E+07	RBC USEPA SSL	NO	BKG

(1) Minimum/maximum detected concentration.
(2) Background Value = Range of concentrations detected in Delaware River background sediment sampling events in 1989 and 1998.
(3) Screening Toxicity Value = Values used are, in order of precedence:
a) New Jersey Soil Cleanup Criteria
b) United States Environmental Protection Agency Soil Screening Levels
c) Risk-Based Concentration for residential land use.

(4) Rationale Codes Selection Reason:
Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)
Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Levels- Both RBCs and potential ARAR/TBC values are used (BSL)

(5) Criteria for chlordane.
(6) Criteria for endosulfan.
(7) Screening Toxicity Value (RBC) is for the 'food' form of manganese.
(8) Screening Toxicity Value (RBC) is for the 'food' form of cadmium.
(9) Screening Toxicity Value (RBC) is for chromium VI.
(10) Concentration Used for Screening = Maximum Concentration.

Sources:
New Jersey Department of Environmental Protection, June 1998. *Guidance Document for the Remediation of Contaminated Soils*.
USEPA: Office of Emergency and Remedial Response, July 1996a. *Soil Screening Guidance: Technical Background Document*.
USEPA: EPA Region III, April 1996b. *EPA Region III Risk-Based Concentrations*.

Definitions:
- = Not Applicable/Not Available
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
JN = Presumptively Present
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic

NJ SCC = New Jersey Soil Cleanup Criteria
USEPA SSL = United States Environmental Protection Agency Soil Screening Levels
RBC = EPA Region III Risk-Based Concentrations

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TABLE 28.4
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Roebling Steel Company Superfund Site

Scenario Timeframe: Current/Future
Medium: Crafts Creek Sediment
Exposure Medium: Sediment
Exposure Point: Sediment

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (9)	Background Value (2)	Screening Toxicity Value (3)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
108-95-2	Phenol	ND		ND		ug/kg	-	0/4	690-1,600	ND	- -	1.00E+07 (a)	4.69E+07 N 4.70E+07	RBC USEPA SSL	NO	IFD
106-44-5	4-methylphenol	68.0	J	96.0	J	ug/kg	RS-SD-18	3/8	1,200-1,600	96.0	-	2.80E+06 (a)	391000 N	RBC	NO	BSL
91-20-3	Naphthalene sv	59.0	J	2,000	J	ug/kg	RS-SD-16D	4/9	380-1,600	2,000	-	230,000 (a)	3.10E+06 N 3.10E+06	RBC USEPA SSL	NO	BSL
91-57-6	2-Methylnaphthalene	40.0	J	2,600	J	ug/kg	RS-SD-16D	4/9	380-1,800	2,600	-	3.10E+06 N (C)	-	-	NO	BSL
111-44-4	Bis(2-ethylhexyl) Phthalate	370	J	740	J	ug/kg	RCSSD3501	4/9	380-1,300	740	-	49,000 (a)	46000 C 46,000	RBC USEPA SSL	NO	BSL
84-74-2	Di-n-butylphthalate	ND		ND		ug/kg	-	0/9	380-1,600	ND	-	6.70E+06 (a)	7.8E+06 N	RBC	NO	IFD
132-64-9	Dibenzofuran	48.0	J	850	J	ug/kg	RS-SD-16D	4/9	380-1,600	850	-	310000 N (C)	-	-	NO	BSL
84-66-2	Diethylphthalate	ND		ND		ug/kg	-	0/9	610-1,600	ND	-	1.00E+07 (a)	6.30E+07 N 6.30E+07	RBC USEPA SSL	NO	IFD
85-68-7	Butylbenzylphthalate	140	J	400	J	ug/kg	RCSSD3501	2/9	380-1,600	400	-	1.10E+06 (a)	1.60E+07 N 1.60E+07	RBC USEPA SSL	NO	BSL
117-84-0	Di-n-octylphthalate	ND		ND		ug/kg	-	0/9	380-1,600	ND	-	1.10E+06 (a)	1.56E+06 N 1.60E+06	RBC USEPA SSL	NO	IFD
86-74-8	Carbazole	ND		ND		ug/kg	-	0/4	690-1,600	ND	-	32,000 (b)	32000 C	USEPA SSL	NO	IFD
83-32-9	Acenaphthene	38.0	J	290	J	ug/kg	RS-SD-17	2/9	380-1,600	290	-	3.40E+06 (a)	4.70E+06 N 4.70E+06	RBC USEPA SSL	NO	BSL
208-96-8	Acenaphthylene	ND		ND		ug/kg	-	0/9	380-1,600	ND	-	-	-	-	NO	IFD
120-12-7	Anthracene	120	J	190	J	ug/kg	RS-SD-17	4/9	380-1,600	190	-	1.00E+07 (a)	2.30E+07 N 2.30E+07	RBC USEPA SSL	NO	BSL
56-55-3	Benzo(a)anthracene	200	J	1,900	J	ug/kg	RS-SD-16D	8/9	380	1,900	-	900 (a)	880 C 900	RBC USEPA SSL	YES	ASL, FD
50-32-8	Benzo(a)pyrene	220	J	920	J	ug/kg	RS-SD-16D	8/9	380	920	79.0-150	660 (a)	88 C 90	RBC USEPA SSL	YES	ASL, FD
205-99-2	Benzo(b)fluoranthene	50.0	J	1,900	J	ug/kg	RS-SD-16D	8/8	-	1,900	56.0-220	900 (a)	880 C 900	RBC USEPA SSL	YES	ASL, FD
191-24-2	Benzo(g,h,i)perylene	170	J	590	J	ug/kg	RS-SD-16D	7/9	380	590	90.0	-	-	-	YES	FD
207-08-9	Benzo(k)fluoranthene	41.0	J	1,500	J	ug/kg	RS-SD-16D	9/9	-	1,500	53.0-210	900 (a)	8800 C	RBC	YES	ASL, FD

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TABLE 2B.4
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Roebling Steel Company Superfund Site

Scenario Timeframe: Current/Future
Medium: Crafts Creek Sediment
Exposure Medium: Sediment
Exposure Point: Sediment

CAS Number	Chemical	(1) Minimum Concentration	Minimum Qualifier	(1) Maximum Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (9)	(2) Background Value	(3) Screening Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	(4) Rationale for Contaminant Deletion or Selection
													9,000	USEPA SSL		
218-01-9	Chrysene	48.0	J	2,400	J	ug/kg	RS-SD-16D	9/9	-	2,400	110-160	9,000 (a)	88000 C	RBC	NO	BSL
													88,000	USEPA SSL		
53-70-3	Dibenzo(a,h)anthracene	ND		ND		ug/kg	-	0/9	380-1,600	ND	-	660 (a)	88 C	RBC	NO	IFD
													90	USEPA SSL		
206-44-0	Fluoranthene	81.0	J	2,300	J	ug/kg	RS-SD-16D	9/9	-	2,300	81.0-260	2.30E+06 (a)	3.10E+06 N	RBC	NO	BSL
													3.10E+08	USEPA SSL		
86-73-7	Fluorene	81.0	J	270	J	ug/kg	RS-SD-17	3/9	380-1,600	270	-	2.30E+06 (a)	3.10E+06 N	RBC	NO	BSL
													3.10E+08	USEPA SSL		
193-39-5	Indeno(1,2,3-cd)pyrene	120	J	420	J	ug/kg	RS-SD-16D	7/9	380	420	89.0	900 (a)	880 C	RBC	NO	BSL
													900	USEPA SSL		
85-01-8	Phenanthrene	47.0	J	1,800	J	ug/kg	RS-SD-16D	0/9	-	1,800	220-260	-	-	-	YES	FD
129-00-0	Pyrene	79.0	J	3,100	J	ug/kg	RS-SD-16D	6/9	-	3,100	65.0-260	1.70E+06 (a)	2.30E+06 N	RBC	NO	BSL
													2.30E+06	USEPA SSL		
319-84-6	alpha-BHC	ND		ND		ug/kg	-	0/9	3.50-200	ND	-	100 (b)	100 C	USEPA SSL	NO	IFD
58-89-9	gamma-BHC (Lindane)	ND		ND		ug/kg	-	0/9	3.50-200	ND	-	520 (a)	490 C	RBC	NO	IFD
													500	USEPA SSL		
57-74-9	alpha-Chlordane	2.10	J	2.10	J	ug/kg	RCSSD3001	1/9	6.40-2,000	2.10	-	500[e] (b)	1,800[e] C	USEPA SSL	NO	BSL
57-74-9	gamma-Chlordane	1.40	J	1.40	J	ug/kg	RCSSD3501	1/9	3.50-2,000	1.40	-	500[e] (b)	1,800(5) C	USEPA SSL	NO	BSL
60-57-1	Dieldrin	2.10	J	2.40	J	ug/kg	RCDSD4001	2/9	12.0-390	2.40	-	42 (a)	40 C	RBC	NO	BSL
													40	USEPA SSL		
													23,000	USEPA SSL		
72-54-8	4,4'-DDD	ND		ND		ug/kg	-	0/9	12.0-390	ND	-	3,000 (a)	2700 C	RBC	NO	IFD
													3,000	USEPA SSL		
72-55-9	4,4'-DDE	4.70	J	4.70	J	ug/kg	RCSSD4001	1/8	6.90-390	4.70	3.40-4.50	2,000 (a)	1900 C	RBC	NO	BSL
													2,000	USEPA SSL		
50-29-3	4,4'-DDT	130	J	130	J	ug/kg	RS-SD-16	1/9	6.90-390	130	-	2,000 (a)	1900 C	RBC	NO	BSL
													2,000	USEPA SSL		
72-20-8	Endrin	ND		ND		ug/kg	-	0/9	12.0-390	ND	-	17,000 (a)	23000 N	RBC	NO	IFD
7421-36-3	Endrin aldehyde	17.0	J	17.0	J	ug/kg	RCSSD3001	1/4	12.0-16.0	17.0	-	-	-	-	YES	FD
76-44-8	Heptachlor	1.10	J	1.20	J	ug/kg	RCDSD4001	2/9	3.50-200	1.20	-	150 (a)	140 C	RBC	NO	BSL
													100	USEPA SSL		
1031-07-8	Endosulfan sulfate	ND		ND		ug/kg	-	0/8	12.0-390	ND	-	-	-	-	NO	IFD

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TABLE 28.4
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Roebling Steel Company Superfund Site

Scenario Timeframe: Current/Future
Medium: Crafts Creek Sediment
Exposure Medium: Sediment
Exposure Point: Sediment

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (9)	Background Value (2)	Screening Toxicity Value (3)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
11097-69-1	Aroclor-1254	190	N	190	N	ug/kg	RCSSD3501	1/9	69.0-3,900	190	17.0-32.0	490 (a)	320 C	RBC	NO	BSL
													1,000	USEPA SSL		
7429-90-5	Aluminum	3,780		24,300	J	ug/kg	RCSSD4001	9/9	-	24,300	3,830-7,930	7.80E+07 N (C)	-	-	NO	NUT
7440-70-2	Calcium	342		5,070		ug/kg	RS-SD-18	9/9	-	5,070	834-1,620	-	-	-	NO	NUT
7439-89-6	Iron	15,200	J	77,100	J	ug/kg	RCSSD4001	9/9	-	77,100	21,100-54,900	2.30E+07 N (C)	-	-	NO	NUT
7439-95-4	Magnesium	669		3,550	J	ug/kg	RCSSD4001	9/9	-	3,560	684-1,730	-	-	-	NO	NUT
7440-09-7	Potassium	707		4,080	J	ug/kg	RCSSD4001	9/9	-	4,080	1,030-3,700	-	-	-	NO	NUT
7440-23-5	Sodium	83.5	J	213	J	ug/kg	RCDSD4001	4/9	744-1,310	213	40.2-49.1	-	-	-	NO	NUT
7440-39-3	Barium	26.6		173	J	ug/kg	RCSSD3601	9/9	-	173	19.8-52.7	700,000 (a)	5.50E+06 N	RBC	NO	BSL
													5.50E+06	USEPA SSL		
7439-96-5	Manganese	40.9		873	J	ug/kg	RCSSD3001	9/9	-	873	92.5-259	1.1E+07(f) N (C)	-	-	NO	BSL
7440-36-0	Antimony	ND		ND		ug/kg	-	0/9	6.60-23.8	ND	-	14,000 (a)	31000 N	RBC	NO	IFD
													31,000	USEPA SSL		
7440-38-2	Arsenic	4.40		23.7	J	ug/kg	RCSSD4001	9/9	4.40-23.7	23.7	10.1-15.2	20,000 (a)	430 C	RBC	NO	BSL
													400	USEPA SSL		
7440-41-7	Beryllium	6.50E-01		3.30	J	ug/kg	RCDSD4001	9/9	-	3.30	0.990-1.30	1,000 (a)	160000 N	RBC	NO	BSL
													100	USEPA SSL		
7440-43-9	Cadmium	9.70E-01	J	3.70	J	ug/kg	RCSSD3501	5/9	0.980-1.50	3.70	-	1,000 (a)	78,000(f) N	RBC	NO	BSL
													78,000	USEPA SSL		
7440-47-3	Chromium	19.6		64.2	J	ug/kg	RCSSD4001	9/9	-	64.2	20.6-34.7	390,000 (b)	390,000(f) N	USEPA SSL	NO	BSL
7440-48-4	Cobalt	3.60		26.5	J	ug/kg	RCSSD3501	9/9	-	26.5	4.20-8.70	4.70E+06 N (C)	-	-	NO	BSL
7440-50-8	Copper	26.6		434	J	ug/kg	RCSSD3501	9/9	-	434	3.10-13.2	600,000 (a)	3.10E+06 N	RBC	NO	BSL
7439-92-1	Lead	77.6		644		ug/kg	RS-SD-16D	9/9	-	644	16.1-18.3	-	400,000	NJ SCC	NO	BSL
													400,000			
7439-97-6	Mercury	1.60E-01	J	4.30		ug/kg	RS-SD-16D	4/9	0.140-0.430	4.30	-	14,000 (a)	23000 N	RBC	NO	BSL
													23,000	USEPA SSL		
7440-02-0	Nickel	7.9	J	45.8	J	ug/kg	RCSSD4001	9/9	-	45.8	5.20-14.0	250,000 (a)	1.60E+06 N	RBC	NO	BSL
													1.60E+06	USEPA SSL		
7782-49-2	Selenium	3.10E-01	J	3.80	J	ug/kg	RCDSD4001	8/9	-	3.80	1.40-2.40	63,000 (a)	390000 N	RBC	NO	BKG
													390,000	USEPA SSL		
7440-22-4	Silver	ND		ND		ug/kg	-	0/9	1.70-3.10	ND	-	110,000 (a)	390000 N	RBC	NO	IFD
													390,000	USEPA SSL		
7440-28-0	Thallium	3.70E-01		1.80	J	ug/kg	RCSSD3001	2/9	0.260-4.50	1.60	-	200 (a)	5500 N	RBC	NO	BSL
7440-62-2	Vanadium	17.9		82.2	J	ug/kg	RCSSD4001	9/9	-	82.2	34.8-39.5	370,000 (a)	650000 N	RBC	NO	BSL

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TABLE 28.4

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Roebling Steel Company Superfund Site

Scenario Timeframe: Current/Future
Medium: Crafts Creek Sediment
Exposure Medium: Sediment
Exposure Point: Sediment

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (9)	Background Value (2)	Screening Toxicity Value (3)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
7440-66-6	Zinc	86.3		1,050	J	ug/kg	RS-SD-16D	9/9	-	1,050	61.9-80.6	1.50E+06 (a)	560,000 2.30E+07 N 2.30E+07	USEPA SSL RBC USEPA SSL	NO	BSL

(1) Minimum/maximum detected concentration.

(2) Background Value = Range of concentrations detected in Crafts Creek background sediment sampling event in 1998.

(3) Screening Toxicity Value = Values used are, in order of precedence:

a) New Jersey Soil Cleanup Criteria

b) United States Environmental Protection Agency Soil Screening Levels

c) Risk-Based Concentration for residential land use.

(4) Rationale Codes Selection Reason:

Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)
Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Levels- Both RBCs and potential ARAR/TBC values are used (BSL)

(5) Criteria for chlordane.

(6) Screening Toxicity Value (RBC) is for the 'food' form of manganese.

(7) Screening Toxicity Value (RBC) is for the 'food' form of cadmium.

(8) Screening Toxicity Value (RBC) is for chromium VI.

(9) Concentration Used for Screening = Maximum Concentration.

Sources:

NJDEP, June 1998. *Guidance Document for the Remediation of Contaminated Soils*.

USEPA: Office of Emergency and Remedial Response, July 1996a. *Soil Screening Guidance. Technical Background Document*.

USEPA: EPA Region III, April 1998b. *EPA Region III Risk-Based Concentrations*.

Definitions:

- = Not Applicable/Not Available
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
JN = Presumptively Present
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic
NJ SCC = New Jersey Soil Cleanup Criteria
USEPA SSL = United States Environmental Protection Agency Soil Screening Levels
RBC = EPA Region III Risk-Based Concentrations

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TABLE 26.5
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Roebling Steel Company Superfund Site

Scenario Timeframe: Current/Future
Medium: Delaware River Surface Water
Exposure Medium: Surface Water
Exposure Point: Tap Water

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (5)	Background Value (2)	Screening Toxicity Value (3)	Potential ARAR/TBC Value (6)	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
7429-90-5	Aluminum	34.0		788		ug/l	RCSSW3301	18/18	-	788	274-1,890	36,500 (C)	-	-	NO	NUT
7440-70-2	Calcium	7,910		13,600	J	ug/l	RCSSW2201, RCSSW2501, RCSSW2601	18/18	-	13,600	12,300-13,600	-	-	-	NO	NUT
7439-89-6	Iron	236	J	4,470	J	ug/l	RCSSW2701	18/18	-	4,470	442-2,020	10,950 (C)	-	-	NO	NUT
7439-95-4	Magnesium	2,430		6,140		ug/l	RCSSW3301	18/18	-	6,140	3,630-4,920	-	-	-	NO	NUT
7440-09-7	Potassium	1,080		3,260		ug/l	RCSSW3301	18/18	-	3,260	1,070-2,050	-	-	-	NO	NUT
7440-23-5	Sodium	4,650		13,100		ug/l	RCSSW3301	18/18	-	13,100	5,650-7,710	-	-	-	NO	NUT
7440-39-3	Barium	24.0		38.4		ug/l	RCSSW3301	18/18	-	38.4	30.0-37.8	2,000 (a)	2555 N	RBC	NO	BSL
7439-96-5	Manganese	40.1		242		ug/l	RCSSW3301	18/18	-	242	56.5-103	5,110 (C)	-	-	NO	BSL
7440-48-4	Cobalt	3.00		4.30		ug/l	RCSSW3301	3/18	1.00-4.00	4.30	-	2,190 (C)	-	-	NO	BSL
7440-50-8	Copper	2.40		7.40	J	ug/l	RS-SW-701	16/18	3.20-5.00	7.40	3.70-7.00	1,460 (C)	-	-	NO	BSL
7439-92-1	Lead	1.20	J	11.4		ug/l	RCSSW3301	17/18	2.8	11.4	1.00-7.30	5.00 (a)	15.00	USEPA	YES	ASL, FD
7440-02-0	Nickel	3.70	J	9.40		ug/l	RCSSW2001	2/18	2.70-10.0	9.40	-	516 (a)	730 607	RBC DRBC	NO	BSL
7440-22-4	Silver	4.70	J	4.70	J	ug/l	RCSSW3201	1/18	1.40-4.00	4.70	-	164 (a)	183 175	RBC DRBC	NO	BSL
7440-28-0	Vanadium	2.30		3.60		ug/l	RCSSW3301	2/18	2.10-3.00	3.50	3.10-3.60	258 (C)	-	-	NO	BKG
7440-66-6	Zinc	15.3		28.5	J	ug/l	RCSSW2401	16/16	-	28.5	29.1-33.1	9,110 (b)	10,950	RBC	NO	BKG

(1) Minimum/maximum detected concentration.
(2) Background Value = Range of concentrations detected in Delaware River background surface water sampling events in 1989 and 1996.
(3) Screening Toxicity Value = Values used are, in order of precedence:
a) New Jersey DEP Surface Water Quality Criteria
b) DRBC Stream Quality Objectives
c) Risk-Based Concentration for residential tap water

(4) Rationale Codes Selection Reason: Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)
Deletion Reason: Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Levels- Both RBCs and potential ARAR/TBC values are used (BSL)
(5) Concentration Used For Screening = Maximum Detected Concentration
(6) Units = ug/l.

Sources: NJDEP, 1997. Surface Water Quality Criteria Applicable to New Jersey: Freshwater Human Health Criteria.
DRBC, 1997. Stream Quality Objectives for Systematic Toxicants for the Delaware River Estuary: Freshwater Objectives for Fish and Water Ingestion.
USEPA: EPA Region III, April 1998b. *EPA Region III Risk-Based Concentrations*.

Definitions:
- = Not Applicable/Not Available
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic
NJDEP = New Jersey Department of Environmental Planning
DRBC = Delaware River Basin Committee
USEPA = Action Level for Lead
RBC = Risk based Concentration

TABLE 20.6
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Roebling Steel Company Superfund Site

Scenario Timeframe: Current/Future
Medium: Crafts Creek Surface Water
Exposure Medium: Surface Water
Exposure Point: Surface Water

CAS Number	Chemical	(1) Minimum Concentration	Minimum Qualifier	(1) Maximum Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (5)	(2) Background Value	(3) Screening Toxicity Value	Potential ARAR/TBC Value (6)	Potential ARAR/TBC Source	COPC Flag	(4) Rationale for Contaminant Deletion or Selection
7429-90-5	Aluminum	84.0		1,650	J	ug/l	RCSSW3501	8/8	-	1,650	3,240-3,840	36,500 (c)	-	-	NO	NUT
7440-70-2	Calcium	8,880		18,100		ug/l	RS-SW-17	8/9	-	18,100	6,550-9,390	-	-	-	NO	NUT
7440-09-7	Potassium	1,650		4,200		ug/l	S-SW-19	9/9	-	4,200	6,000-6,720	-	-	-	NO	NUT
7440-23-5	Sodium	6,090		18,100		ug/l	RS-SW-18	9/9	-	18,100	4,770-5,490	-	-	-	NO	NUT
7439-89-6	Iron	444		8,580		ug/l	S-SW-19	5/5	-	8,580	10,400-16,700	10,950 (c)	-	-	NO	NUT
7439-95-4	Magnesium	3,350		9,110		ug/l	S-SW-19	9/9	-	9,110	3,790-4,170	-	-	-	NO	NUT
7440-39-3	Barium	27.4		59.6		ug/l	S-SW-19	9/9	-	59.6	37.2-39.6	2,000 (a)	2555 N	RBC	NO	BSL
7439-96-5	Manganese	83.1		472		ug/l	RS-SW-18	9/9	-	472	141-225	5110[7] (c)	-	-	NO	BSL
7440-38-2	Arsenic	1.90		1.90		ug/l	S-SW-19	1/9	1.0-4.1	1.90	4.10-7.10	0.017 (a)	0.045 9.19	RBC DRBC	NO	BKG
7440-48-4	Cobalt	1.80		2.10		ug/l	RCSSW3501	3/9	3-8.0	2.10	3.70-4.60	2,190 (c)	-	-	NO	BKG
7440-50-8	Copper	3.70		34.9		ug/l	RS-SW-17	5/9	3-6.0	34.9	4.20-4.20	1,460 (c)	-	-	NO	BSL
7439-92-1	Lead	1.20	J	21.3	J	ug/l	S-SW-19	9/9	-	21.3	8.20-8.10	5.00 (a)	16.00	USEPA	YES	ASL, FD
7440-22-4	Silver	3.90		3.90		ug/l	RCDSW4001	1/9	3-8.0	3.90	-	516 (a)	183 907	RBC DRBC	NO	BSL
7440-62-2	Vanadium	4.40		4.40		ug/l	RCDSSW3501	2/9	2-6.0	4.40	12.9-14.1	256 (c)	-	-	NO	BKG
7440-66-6	Zinc	18.8		111		ug/l	RS-SW-17	9/9	-	111	25.8-27.8	9,110 (b)	10,950	RBC	NO	BSL

(1) Minimum/maximum detected concentration.
(2) N/A - Refer to supporting information for background discussion.
Background values derived from statistical analysis. Follow Regional guidance and provide supporting information.
(3) Screening Toxicity Value = Values used are, in order of precedence:
a) New Jersey DEP Surface Water Quality Standards (Human Health)
b) DRBC Stream Quality Objectives
c) Risk-Based Concentration for residential tap water

(4) Rationale Codes Selection Reason: Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)
Deletion Reason: Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Levels- Both RBCs and potential ARAR/TBC values are used (BSL)
(5) Concentration Used For Screening = Maximum Detected Concentration
(6) Units = ug/l.
(7) Screening Toxicity Value (RBC) is for the 'food' form of manganese.

Sources: NJDEP, 1997. Surface Water Quality Criteria Applicable to New Jersey: Freshwater Human Health Criteria.
DRBC, 1997. Stream Quality Objectives for Systematic Toxicants for the Delaware River Estuary: Freshwater Objectives for Fish and Water Ingestion.

Definitions:
- = Not Applicable/Not Available
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic
NJDEP = New Jersey Department of Environmental Planning Surface Water Quality Criteria
DRBC = Delaware River Basin Committee
USEPA = Action Level for Lead
RBC = Risk based Concentration

TABLE 28.7
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Roebling Steel Company Superfund Site

Scenario Timeframe: Current/Future
Medium: Crafts Creek Surface Water
Exposure Medium: Fish Tissue
Exposure Point: Fish from Crafts Creek

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (6)	Background Value (2)	Screening Toxicity Value (3)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
72-54-8	4,4'-DDD	20.0	J	32.0	J	ug/kg	RS-CF-02	2/5	14.0-18.0	32.0	N/A	13 C	-	-	YES	ASL, FD
72-55-9	4,4'-DDE	19.0	J	83.0	J	ug/kg	RS-CF-03D	5/5	-	83.0	N/A	9 C	-	-	YES	ASL, FD
7429-90-5	Aluminum	1.90	J	8.70	J	mg/kg	RS-CF-04	5/5	-	8.70	N/A	1,400 N	-	-	NO	NUT
7440-70-2	Calcium	1,120	J	8,330	J	mg/kg	RS-CF-03	5/5	-	8,330	N/A	-	-	-	NO	NUT
7439-95-4	Magnesium	307	J	511		mg/kg	RS-CF-01	5/5	-	511	N/A	-	-	-	NO	NUT
7440-09-7	Potassium	3,300		6,390		mg/kg	RS-CF-01	5/5	-	6,390	N/A	-	-	-	NO	NUT
7440-23-5	Sodium	489	J	1,120	J	mg/kg	RS-CF-03	5/5	-	1,120	N/A	-	-	-	NO	NUT
7439-96-5	Manganese	1.00	J	1.80	J	mg/kg	RS-CF-03	3/3	-	1.80	N/A	190[5] N	-	-	NO	BSL
7440-50-8	Copper	3.40	J	98.0	J	mg/kg	RS-CF-04	4/5	1.00	98.0	N/A	54 N	-	-	YES	ASL, FD
7439-89-6	Iron	12.6	J	28.8	J	mg/kg	RS-CF-03	5/5	-	28.8	N/A	410 N	-	-	NO	NUT
7439-92-1	Lead	2.30	J	4.40	J	mg/kg	RS-CF-04	2/5	1.00	4.40	N/A	- C	-	-	YES	FD
7439-97-6	Mercury	4.00E-01		4.00E-01		mg/kg	RS-CF-01	1/5	2.60E-01	4.00E-01	N/A	- N	-	-	YES	FD
7440-62-2	Vanadium	1.00		1.00		mg/kg	RS-CF-03D	1/5	1.00	1.00	N/A	8.6 N	-	-	YES	ASL, FD
7440-66-6	Zinc	9.20		65.0		mg/kg	RS-CF-04	5/5	-	65.0	N/A	410 N	-	-	YES	ASL, FD

(1) Minimum/maximum detected concentration.
(2) N/A - Not Applicable; no background data available
(3) Screening Toxicity Value = Risk-Based Concentration for fish.
EPA Region III, 1998b. EPA Region III Risk-Based Concentrations (RBCs).
(4) Rationale Codes
Selection Reason: Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)
Deletion Reason: Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Levels- Both RBCs and potential ARAR/TBC values are used (BSL)
(5) Screening Toxicity Value (RBC) is for the 'food' form of manganese.
(6) Concentration Used for Screening = Maximum Concentration.

Definitions:
- = Not Applicable/Not Available
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic

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TABLE 28.8
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Roebling Steel Company Superfund Site

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air Particulates
Exposure Point: Downwind Air Particulates

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
7429-90-5	Aluminum	0.45		0.56		μg/m³	RS-AR05-003	2/2	-	0.56	N/A	3.65 N	-	-	NO	NUT
7440-70-2	Calcium	2.6		2.6		μg/m³	RS-AR2B-002	1/1	-	2.6	N/A	-	-	-	NO	NUT
7439-89-6	Iron	0.24	J	3.41	J	μg/m³	RS-AR04-004	24/24	-	3.41	N/A	1,095 N	-	-	NO	NUT
7439-95-4	Magnesium	0.54		0.9		μg/m³	RS-AR04-003	12/12	-	0.9	N/A	-	-	-	NO	NUT
7440-09-7	Potassium	0.29		0.71		μg/m³	RS-AR04-002	18/18	-	0.71	N/A	-	-	-	NO	NUT
7440-39-3	Barium	0.01	J	0.021	J	μg/m³	RS-AR04-003	23/24	1.78E-02	0.021	N/A	0.511 N	-	-	NO	BSL
7439-96-5	Manganese	0.009	J	0.2219	J	μg/m³	RS-AR04-004	24/24	-	0.22	N/A	0.00522(5) N	-	-	YES	ASL, FD
7440-36-0	Antimony	0.0022		0.0038		μg/m³	RS-AR2A-002	11/24	2.12E-03-2.28E-02	0.0038	N/A	1.46 N	-	-	NO	BSL
7440-38-2	Arsenic	0.0004		0.0028		μg/m³	RS-AR04-002	24/24	-	0.0028	N/A	4.16E-04 C	-	-	YES	ASL, FD
7440-43-9	Cadmium	0.0006		0.0017		μg/m³	RS-AR04-004	8/24	6.10E-04-6.70E-04	0.0017	N/A	9.94E-04(6) C	-	-	YES	ASL, FD
7440-48-4	Cobalt	0.0009		0.0017		μg/m³	RS-AR01-002	6/23	8.90E-04-1.10E-03	0.0017	N/A	219 N	-	-	NO	BSL
7440-50-8	Copper	0.022		0.077		μg/m³	RS-AR2B-002	24/24	-	0.077	N/A	146 N	-	-	NO	BSL
7439-92-1	Lead	0.012	J	0.198	J	μg/m³	RS-AR04-004	24/24	-	0.198	N/A	-	1.5	NAAQS	YES	FD
7440-02-0	Nickel	0.0028	J	0.0195	J	μg/m³	RS-AR03-002	24/24	-	0.0195	N/A	73.0 N	-	-	NO	BSL
7440-22-4	Silver	0.0012	J	0.0012	J	μg/m³	RS-AR03-003	3/21	9.20E-04-1.24E-03	0.0012	N/A	18.3 N	-	-	NO	BSL
7440-28-0	Thallium	0.0002	J	0.0002	J	μg/m³	RS-AR04-001	3/24	1.00E-04-1.40E-04	0.0002	N/A	0.256 N	-	-	NO	BSL
7440-62-2	Vanadium	0.0023	J	0.0103	J	μg/m³	RS-AR04-004	24/24	-	0.0103	N/A	25.6 N	-	-	NO	BSL
7440-66-6	Zinc	0.053	J	0.617	J	μg/m³	RS-AR04-004	24/24	-	0.617	N/A	1,095 N	-	-	NO	BSL

(1) Minimum/maximum detected concentration.
(2) N/A - Not Applicable; no background data available
(3) Screening Toxicity Value = Risk-Based Concentration for ambient air.
EPA Region III, 1998b. EPA Region III Risk-Based Concentrations (RBCs).
(4) Rationale Codes Selection Reason: Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)
Deletion Reason: Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Levels- Both RBCs and potential ARAR/TBC values are used (BSL)
(5) Screening Toxicity Value (RBC) is for the 'food' form of manganese.
(6) Screening Toxicity Value (RBC) is for the 'food' form of cadmium.
(7) Screening Toxicity Value (RBC) is for chromium VI.
(8) Concentration Used for Screening = Maximum Concentration.

Definitions:
- = Not Applicable/Not Available
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
JN = Presumptively Present
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic
NAAQS = National Ambient Air Quality Standards
RBC = Risk Based Concentration

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Table 28.9
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Tap Water

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
67-64-1	Acetone	6.00		6.00		µg/l	RCDMW26301	1/17		6.00	N/A	700 (3)	3,650 N	RBC	NO	BSL
75-34-3	1,1-Dichloroethane	3.00	J	3.00	J	µg/l	RCSMW32D102	1/36		3.00	N/A	70 (3)	798 N	RBC	NO	BSL
78-93-3	Methyl ethyl ketone	6.00		6.00		µg/l	RCDMW26301	1/36		6.00	N/A	300 (3)	1,906 N	RBC	NO	BSL
79-01-06	Trichloroethene	3.00	J	3.00	J	µg/l	RCSMW01101	1/36		3.00	N/A	1.0 (3)	1.65 C	RBC	YES	ASL, FD
108-95-2	Phenol	0.60	J	6.00	J	µg/l	RSMW31	4/30		6.00	N/A	4000 (3)	21,900 N	RBC	NO	IRD
106-44-5	4-Methylphenol	0.70	J	0.70	J	µg/l	RSMW40	1/31		0.70	N/A	100 (4)	183 N	RBC	NO	IRD
117-81-7	bis(2-Ethylhexyl)phthalate	1.00	J	1.00	J	µg/l	RCSMW14D102	1/31		1.00	N/A	30 (3)	4.8 C	RBC	NO	IRD
85-68-7	Butylbenzylphthalate	0.10	J	0.30	J	µg/l	RSMW40	3/31		0.30	N/A	100 (3)	7,300 N	RBC	NO	IRD
84-66-2	Diethylphthalate	0.10	J	0.50	J	µg/l	RSMW31	7/31		0.50	N/A	5000 (3)	29,000 N	RBC	NO	IRD
50-32-8	Benzo(a)pyrene	0.10	J	0.10	J	µg/l	RSMW42	1/31		0.10	N/A	5 (4)	0.0092 C	RBC	NO	IRD
83-32-9	Acenaphthene	0.80	J	0.80	J	µg/l	RSMW37	1/31		0.80	N/A	400 (3)	2,200 N	RBC	NO	IRD
120-12-7	Anthracene	0.30	J	0.30	J	µg/l	RSMW37	1/31		0.30	N/A	2000 (3)	12,000 N	RBC	NO	IRD
132-64-9	Dibenzofuran	0.30	J	0.30	J	µg/l	RSMW37	1/31		0.30	N/A	100 (4)	160 N	RBC	NO	IRD
206-44-0	Fluoranthene	0.40	J	0.60	J	µg/l	RSMW37	2/31		0.60	N/A	300 (3)	1,600 N	RBC	NO	IRD
86-73-7	Fluorene	1.00	J	1.00	J	µg/l	RSMW37	1/31		1.00	N/A	300 (3)	1,600 N	RBC	NO	IRD
91-20-3	Naphthalene	0.60	J	0.60	J	µg/l	RSMW37	2/31		0.80	N/A	100 (4)	1,600 N	RBC	NO	IRD
91-57-6	2-Methylnaphthalene	0.60	J	0.60	J	µg/l	RSMW37	2/31		0.60	N/A	100 (4)	1,600 N	RBC	NO	IRD
85-01-8	Phenanthrene	0.20	J	2.00	J	µg/l	RSMW37	5/31		2.00	N/A	100 (4)	-	-	NO	IRD
129-00-0	Pyrene	0.20	J	0.60	J	µg/l	RSMW37	3/31		0.60	N/A	200 (3)	1,100 N	RBC	NO	IRD
72-54-8	4,4'-DDD	0.01	J	0.008	J	µg/l	RSMW41	1/31		0.008	N/A	0.1 (3)	0.28 C	RBC	NO	IRD
50-29-3	4,4'-DDT	0.01	JN	0.005	JN	µg/l	RSMW41	1/31		0.005	N/A	0.1 (3)	0.20 C	RBC	NO	IRD
1024-57-3	Heptachlor epoxide	0.01	J	0.009	J	µg/l	RSMW35	1/31		0.009	N/A	0.2 (3)	0.0012 C	RBC	NO	IRD
7429-90-5	Aluminum	27.50		14,400		µg/l	RCSMW14S101	22/54		14,400	N/A	200 (3)	37,000 N	RBC	NO	NUT
7440-70-2	Calcium	7,000		384,000	J	µg/l	RCDMW14D101	56/57		384,000	N/A	- -	-		NO	NUT
7439-89-6	Iron	41.20		330,000		µg/l	RCSMW24D101	37/68		330,000	N/A	300 (3)	11,000 N	RBC	NO	NUT
7439-95-4	Magnesium	2,750		94,000		µg/l	RCSMW10101	42/67		94,000	N/A	- -	-	-	NO	NUT
7440-09-7	Manganese	0.87		16,300	J	µg/l	RCSMW20101	41/67		16,300	N/A	50 (3)	840 N	RBC	YES	ASL, FD
7440-23-5	Potassium	13.00		32,000		µg/l	RCSMW14D101	36/57		32,000	N/A	- -	-	-	NO	NUT
7440-39-3	Sodium	13.00		159,000		µg/l	RCSMW17D101	54/57		159,000	N/A	50,000 (3)	-	-	NO	NUT
7439-96-5	Arsenic	2.30		95		µg/l	RCSMW17D102	11/67		95	N/A	8 (3)	0.045 C	RBC	YES	ASL, FD

Table 28.9
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Tap Water

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
7440-39-2	Barium	3.60		600.00		µg/l	RCSMW14D101	22/67		600	N/A	2000 (3)	2,800 N	RBC	NO	BSL
7440-41-7	Beryllium	0.14		22		µg/l	RCSMW24D101	4/67		22	N/A	20 (3)	0.016 C	RBC	YES	ASL, FD
7440-43-9	Cadmium	0.23		1.20		µg/l	RCSMW18D101	8/67		1.20	N/A	4 (3)	18 N	RBC	NO	BSL
7440-47-3	Chromium	0.84		54.0	J	µg/l	RCSMW24D101	15/66		64.0	N/A	100 (3)	180 N(7)	RBC	NO	BSL
7440-48-4	Cobalt	1.80		61.0		µg/l	RCSMW24D101	13/57		61.0	N/A	- -	2,200 N	RBC	NO	BSL
7440-50-8	Copper	1.80		39.0		µg/l	RCSMW42	16/67		39.0	N/A	1,000 (3)	1,500 N	RBC	NO	BSL
7439-92-1	Lead	0.60		66.8		µg/l	RCS-MW42	21/47		66.8	N/A	10 (3)	15 (5)	RBC	YES	ASL, FD
7439-97-6	Mercury	0.32		0.64		µg/l	RCSMW32D101	2/40		0.64	N/A	2 (3)	11 N	RBC	NO	BSL, IFD
7440-02-0	Nickel	5.20		91.0		µg/l	RCSMW24D101	11/64		91.0	N/A	100 (3)	730 N	RBC	NO	ASL, FD
7782-49-2	Selenium	2.50	J	6.40	J	µg/l	RCDMW17101	3/57		6.40	N/A	50 (3)	180 N	RBC	NO	BSL
7440-22-4	Silver	1.60		2.60		µg/l	RCSMW32BD102	3/56		2.60	N/A	-	180 N	RBC	NO	BSL
7440-62-2	Vanadium	1.70		77.0		µg/l	RCSMW34301	9/67		77.0	N/A	-	260 N	RBC	YES	ASL, FD
7440-66-6	Zinc	6.00		20,700		µg/l	RCSMW32D101	28/61		20,700	N/A	5,000 (3)	11,000 N	RBC	YES	ASL, FD

(1) Minimum/maximum detected concentration.
(2) N/A - Not Applicable; no background data available
(3) New Jersey Groundwater Quality Criteria (NJGWQC)
Table 1 Specific Ground Water Quality Criteria
(4) Table 2 Interim Generic Ground Water Quality Criteria
(5) Rationale Codes Selection Reason: Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)
Deletion Reason: Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Levels- Both RBCs and potential ARAR/TBC values are used (BSL)
(6) USEPA Action for Lead
(7) Screening Toxicity Value (RBC) is for chromium VI.
Source: Concentration Used for Screening = Maximum Concentration.
New Jersey Safe Drinking Water Act, Maximum Contaminant Levels, NJAC 7:10-16.
New Jersey Groundwater Quality Criteria, NJAC 7:9-6.6.

Definitions:
- = Not Applicable/Not Available
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
JN = Presumptively Present
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic
NJ MCL = New Jersey Maximum Contaminant Levels
RBC = Region III Risk-Based Concentration for Tapwater

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TABLE 28.10
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Water Vapors at Showerhead

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (5)
67-64-1	Acetone	5		5.00		µg/l	RCDMW26301	1/17		5.00	N/A	700 (4)	3650	RBC	NO	BSL
75-34-3	1,1-Dichloroethane	3	J	3.00	J	µg/l	RCSMW32D102	1/36		3.00	N/A	70 (4)	798	RBC	NO	BSL
78-93-3	Methyl ethyl ketone	5		5.00		µg/l	RCDMW26301	1/36		5.00	N/A	300 (4)	1906	RBC	NO	BSL
79-01-06	Trichloroethene	3.00	J	3.00	J	µg/l	RCSMW01101	1/36		3.00	N/A	1.00 (3)	1.55	RBC	YES	ASL, FD

(1) Minimum/maximum detected concentration.
(2) N/A - Not Applicable; no background data available
(3) New Jersey Maximum Contaminant Level (NJMCL)
(4) New Jersey Groundwater Quality Criteria
(5) Rationale Codes Selection Reason: Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)
Deletion Reason: Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)
(6) Screening Toxicity Value (RBC) is for the 'food' form of manganese.
(7) Screening Toxicity Value (RBC) is for the 'food' form of cadmium.
(8) Screening Toxicity Value (RBC) is for chromium VI.
(9) Concentration Used for Screening = Maximum Concentration.

Sources: New Jersey Safe Drinking Water Act, Maximum Contaminant Levels, NJAC 7:10-16.
New Jersey Groundwater Quality Criteria, NJAC 7:9-6.6.

Definitions:
- = Not Applicable/Not Available
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
JN = Presumptively Present
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic
RBC = Risk based Concentration

Table 28.11

Occurrence, Distribution, and Selection of Chemicals of Concern (COC) in the Delaware River

Exposure Medium: Sediment

Chemical of Potential Concern	Minimum Conc.[1] (ppm)	Maximum Conc.[1] (ppm)	Background Conc. [2] (ppm)	Screening Toxicity Value (ppm)	Screening Toxicity Value Source[2]	COC Flag (Y or N)
2-Methylnapthalene	0.042	0.071	-	0.070	U.S., ER-L	Y
Acenapthene	0.045	0.045	-	0.016	U.S., ER-L	Y
Acenapthylene	0.045	0.190	-	-	-	Y
Anthracene	0.051	0.340	-	0.085	U.S., ER-L	Y
Benzo(a)anthracene	0.200	0.850	0.035-0.570	0.261	U.S., ER-L	Y
Benzo(a)pyrene	0.230	0.940	0.040-0.620	0.370	ONT, LEL	Y
Benzo(b)fluoranthene	0.450	1.0	0.300-0.630	-	-	Y
Benzo(g,h,i)perylene	0.080	0.550	0.023-0.350	0.170	ONT., LEL	Y
Benzo(k)fluoranthene	0.039	1.0	0.230-0.660	0.240	ONT., LEL	Y
Chrysene	0.065	1.0	0.042-0.680	0.340	ONT, LEL	Y
Dibenzo(a,h)anthracene	0.073	0.230	-	0.060	ONT., LEL	Y
Fluoranthene	0.072	1.6	0.067-1.1	0.600	U.S., ER-L	Y
Fluorene	0.048	0.110	0.420-0.940	0.019	U.S., ER-L	Y
Indeno(1,2,3-cd)pyrene	0.074	0.560	0.024-0.350	0.200	ONT., LEL	Y
Phenanthrene	0.072	0.830	0.027-0.450	0.240	U.S., ER-L	Y
Pyrene	0.100	1.5	0.050-1.0	0.490	ONT., LEL	Y
Arsenic	5.3	76	2,000-8,200	6	ONT., LEL	Y
Chromium	32.2	203	11,400-46,200	26	ONT., LEL	Y
Copper	47.5	475	14,900-76,600	16	ONT., LEL	Y
Iron	31,200	301,000	1,580,000-3,440,000	20,000	ONT., LEL	Y
Lead	79.2	1,060	33,300-83,600	31	ONT., LEL	Y
Manganese	540	1,900	201,000-1,190,000	460	ONT., LEL	Y
Zinc	378	7,720	182,000-903,000	120	ONT., LEL	Y

Key
Conc. = Concentration
- = Not Available/Not Applicable

Notes
[1] Minimum/ maximum detected concentration above the sample quantitation limit (SQL).
[2] Background Value=Range of background concentrations detected in Delaware River background sediment sampling events in 1989 and 1996.
[3] Ont LEL = Ontario Lowest Effects Level: Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario. Persaud, R. Jaagumagi, and A. Hayton. Ontario Ministry of the Environment, Ontario, August 1993.
U.S., ER-L = The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program. NOAA Technical Memorandum NOS OMA 52. E.R. Long and L.G. Morgan, 1990.

Table 28.11

Occurrence, Distribution, and Selection of Chemicals of Concern (COC) in Crafts Creek

Exposure Medium: Sediment

Chemical of Potential Concern	Minimum Conc.[1] (ppm)	Maximum Conc.[1] (ppm)	Background Conc.[2] (ppm)	Screening Toxicity Value (ppm)	Screening Toxicity Value Source [3]	COC Flag (Y or N)
2-Methylnapthalene	0.040	2.6	-	0.070	U.S., ER-L	Y
Acenapthene	0.038	0.290	-	0.016	U.S., ER-L	Y
Acenapthylene	ND	ND	-	-	-	Y
Anthracene	0.120	0.190	-	0.085	U.S., ER-L	Y
Benzo(a)anthracene	0.200	1.9	-	0.261	U.S., ER-L	Y
Benzo(a)pyrene	0.220	0.920	0.079-0.150	0.370	ONT., LEL	Y
Benzo(b)fluoranthene	0.050	1.9	0.056-0.220	-	-	Y
Benzo(g,h,i)perylene	0.170	0.590	.090	0.170	ONT., LEL	Y
Benzo(k)fluoranthene	0.041	1.5	0.053-0.210	0.240	ONT., LEL	Y
Chrysene	0.048	2.4	0.110-0.160	0.340	ONT., LEL	Y
Dibenzo(a,h)anthracene	ND	ND	-	0.060	ONT., LEL	Y
Fluoranthene	0.081	2.3	0.061-0.290	0.600	U.S., ER-L	Y
Fluorene	0.081	0.270	-	0.019	U.S., ER-L	Y
Indeno(1,2,3-cd)pyrene	0.120	0.420	.089	0.200	ONT., LEL	Y
Phenanthrene	0.047	1.8	0.220-0.260	0.240	U.S., ER-L	Y
Pyrene	0.079	3.1	0.065-0.290	0.490	ONT., LEL	Y
Arsenic	4.4	23.7	10.1-15.2	6	ONT., LEL	Y
Chromium	19.6	64.2	20.5-34.7	26	ONT. LEL	Y
Copper	26.8	434	3.1-13.2	16	ONT., LEL	Y
Iron	15,200	77,100	21,100-54,900	20,000	ONT., LEL	Y
Lead	77.6	644	15.1-18.3	31	ONT., LEL	Y
Manganese	40.9	873	92.5-259	460	ONT., LEL	Y
Zinc	86.3	1,050	61.9-80.6	120	ONT., LEL	Y

Key
Conc. = Concentration
- = Not Available/Not Applicable

Notes
[1] Minimum/ maximum detected concentration above the sample quantitation limit (SQL).
[2] Background Value=Range of background concentrations detected in Delaware River background sediment sampling events in 1989 and 1996.
[3] Ont LEL = Ontario Lowest Effects Level: Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario. D. Persaud, R. Jaagumagi, and A. Hayton. Ontario Ministry of the Environment, Ontario, August 1993.
U.S., ER-L = The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program. NOAA Technical Memorandum NOS OMA 52. E.R. Long and L.G. Morgan, 1990.

TABLE 29

SELECTION OF EXPOSURE PATHWAYS

Roebling Steel Company Superfund Site

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	Surface Soil	Surface Soil	Surface Soil	Trespasser	Child	Ingestion	On-Site	Quant	It is assumed that child trespassers may ingest surface soil while on-site.
						Dermal	On-Site	Quant	It is assumed that child trespassers may have dermal contact with surface soil while on-site.
						Inhalation	On-Site	Quant	It is assumed that child trespassers may inhale surface soil while on-site.
		Air Particulates	Downwind Air Particulates	Downwind Resident	Adult	Ingestion	Off-Site	None	It is assumed that downwind residents will not have on-site contact with surface soil.
						Dermal	Off-Site	None	It is assumed that downwind residents will not have on-site contact with surface soil.
						Inhalation	Off-Site	Quant	Residents currently live downwind of the site and therefore may be exposed to particulate surface soil matter originating from the site.
					Child	Ingestion	Off-Site	None	It is assumed that downwind residents will not have on-site contact with surface soil.
						Dermal	Off-Site	None	It is assumed that downwind residents will not have on-site contact with surface soil.
						Inhalation	Off-Site	Quant	Residents currently live downwind of the site and therefore may be exposed to particulate surface soil matter originating from the site.
Future	Surface Soil	Surface Soil	Surface Soil	Resident	Adult	Ingestion	On-Site	Quant	It is assumed that the potential exists for future residential development of the site.
						Dermal	On-Site	Quant	It is assumed that the potential exists for future residential development of the site.
						Inhalation	On-Site	None	It is assumed that anticipated landscaping, paving, etc. will eliminate the surface soil inhalation exposure pathway.
					Child	Ingestion	On-Site	Quant	It is assumed that the potential exists for future residential development of the site.
						Dermal	On-Site	Quant	It is assumed that the potential exists for future residential development of the site.
						Inhalation	On-Site	None	It is assumed that anticipated landscaping, paving, etc. will eliminate the surface soil inhalation exposure pathway.

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SELECTION OF EXPOSURE PATHWAYS
Roebling Steel Company Superfund Site

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
				Site Worker	Adult	Ingestion	On-Site	Quant	It is assumed that the potential exists for future commercial/industrial development of the site.
						Dermal	On-Site	Quant	It is assumed that the potential exists for future commercial/industrial development of the site.
						Inhalation	On-Site	None	It is assumed that anticipated landscaping, paving, etc. will eliminate the surface soil inhalation exposure pathway.
				Con-struction Worker	Adult	Ingestion	On-Site	Quant	It is assumed that the potential exists for future commercial/industrial development of the site.
						Dermal	On-Site	Quant	It is assumed that the potential exists for future commercial/industrial development of the site.
						Inhalation	On-Site	Quant	It is assumed that the potential exists for future commercial/industrial development of the site.
	Subsurface Soil	Subsurface Soil	Subsurface Soil	Resident	Adult	Ingestion	On-Site	Quant	It is assumed that the potential residential, commercial, and/or industrial development of the site may expose previously unexposed subsurface soils.
						Dermal	On-Site	Quant	It is assumed that the potential residential, commercial, and/or industrial development of the site may expose previously unexposed subsurface soils.
						Inhalation	On-Site	None	It is assumed that anticipated landscaping, paving, etc. will eliminate the subsurface soil inhalation exposure pathway.
					Child	Ingestion	On-Site	Quant	It is assumed that the potential residential, commercial, and/or industrial development of the site may expose previously unexposed subsurface soils.
						Dermal	On-Site	Quant	It is assumed that the potential residential, commercial, and/or industrial development of the site may expose previously unexposed subsurface soils.
						Inhalation	On-Site	None	It is assumed that anticipated landscaping, paving, etc. will eliminate the subsurface soil inhalation exposure pathway.
				Site Worker	Adult	Ingestion	On-Site	Quant	It is assumed that the potential residential, commercial, and/or industrial development of the site may expose previously unexposed subsurface soils.

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SELECTION OF EXPOSURE PATHWAYS
Roebling Steel Company Superfund Site

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
						Dermal	On-Site	Quant	It is assumed that the potential residential, commercial, and/or industrial development of the site may expose previously unexposed subsurface soils.
						Inhalation	On-Site	None	It is assumed that anticipated landscaping, paving, etc. will eliminate the subsurface soil inhalation exposure pathway.
				Con-struction Worker	Adult	Ingestion	On-Site	Quant	It is assumed that the potential residential, commercial, and/or industrial development of the site may expose previously unexposed subsurface soils.
						Dermal	On-Site	Quant	It is assumed that the potential residential, commercial, and/or industrial development of the site may expose previously unexposed subsurface soils.
						Inhalation	On-Site	Quant	It is assumed that exposure to subsurface soil may occur during potential construction activities.
	Groundwater	Groundwater	Tap Water	Resident	Adult	Ingestion	On-Site	Quant	It is assumed that groundwater serves as a source for the residential water supply.
						Dermal	On-Site	Quant	It is assumed that groundwater serves as a source for the residential water supply.
					Child	Ingestion	On-Site	Quant	It is assumed that groundwater serves as a source for the residential water supply.
						Dermal	On-Site	Quant	It is assumed that groundwater serves as a source for the residential water supply.
				Site Worker	Adult	Ingestion	On-Site	Quant	It is assumed that groundwater serves as a source for the on-site water supply.
						Dermal	On-Site	None	It is assumed that site workers will have negligible dermal contact with groundwater.
		Air	Water Vapors at Shower-head	Resident	Adult	Inhalation	On-Site	Quant	It is assumed that groundwater serves as a source for the residential water supply.
					Child	Inhalation	On-Site	Quant	It is assumed that groundwater serves as a source for the residential water supply.
				Site Worker	Adult	Inhalation	On-Site	None	It is assumed that site workers will not be showering at the site.

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SELECTION OF EXPOSURE PATHWAYS
Roebling Steel Company Superfund Site

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current- and Future-Use	Delaware River Sediment	Sediment	Sediment	Resident	Adult	Ingestion	On-Site	Quant	Residents currently live in the vicinity of the site and the potential exists for future residential development of the site. Therefore, current and future residents may be exposed to sediment while recreating in the river.
						Dermal	On-Site	Quant	Residents currently live in the vicinity of the site and the potential exists for future residential development of the site. Therefore, current and future residents may be exposed to sediment while recreating in the river.
						Inhalation	On-Site	None	Due to the nature of the sediment, the exposure pathway cannot be completed.
					Child	Ingestion	On-Site	Quant	Residents currently live in the vicinity of the site and the potential exists for future residential development of the site. Therefore, current and future residents may be exposed to sediment while recreating in the river.
						Dermal	On-Site	Quant	Residents currently live in the vicinity of the site and the potential exists for future residential development of the site. Therefore, current and future residents may be exposed to sediment while recreating in the river.
						Inhalation	On-Site	None	Due to the nature of the sediment, the exposure pathway cannot be completed.
	Crafts Creek Sediment	Sediment	Sediment	Resident	Adult	Ingestion	On-Site	Quant	Residents currently live in the vicinity of the site and the potential exists for future residential development of the site. Therefore, current and future residents may be exposed to sediment while recreating in the creek.
						Dermal	On-Site	Quant	Residents currently live in the vicinity of the site and the potential exists for future residential development of the site. Therefore, current and future residents may be exposed to sediment while recreating in the creek.
						Inhalation	On-Site	None	Due to the nature of the sediment, the exposure pathway cannot be completed.
					Child	Ingestion	On-Site	Quant	Residents currently live in the vicinity of the site and the potential exists for future residential development of the site. Therefore, current and future residents may be exposed to sediment while recreating in the creek.

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SELECTION OF EXPOSURE PATHWAYS

Roebling Steel Company Superfund Site

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
						Dermal	On-Site	Quant	Residents currently live in the vicinity of the site and the potential exists for future residential development of the site. Therefore, current and future residents may be exposed to sediment while recreating in the creek.
						Inhalation	On-Site	None	Due to the nature of the creek, the exposure pathway cannot be completed.
	Delaware River Surface Water	Surface Water	Tap Water	Residents	Adult	Ingestion	On-Site	Quant	It is assumed that the Delaware River serves as a source of water for the surrounding residential areas.
						Dermal	On-Site	Quant	It is assumed that the Delaware River serves as a source of water for the surrounding residential areas.
					Child	Ingestion	On-Site	Quant	It is assumed that the Delaware River serves as a source of water for the surrounding residential areas.
						Dermal	On-Site	Quant	It is assumed that the Delaware River serves as a source of water for the surrounding residential areas.
		Air	Water Vapors at Shower-head	Residents	Adult	Inhalation	On-Site	Quant	It is assumed that the Delaware River serves as a source of water for the surrounding residential areas.
					Child	Inhalation	On-Site	Quant	It is assumed that the Delaware River serves as a source of water for the surrounding residential areas.
	Crafts Creek Surface Water	Surface Water	Surface Water	Residents	Adult	Ingestion	On-Site	Quant	Residents currently live in the vicinity of the site and the potential exists for future residential development of the site, so current and future residents may be exposed to surface water while recreating in the creek.
						Dermal	On-Site	Quant	Residents currently live in the vicinity of the site and the potential exists for future residential development of the site, so current and future residents may be exposed to surface water while recreating in the creek.
					Child	Ingestion	On-Site	Quant	Residents currently live in the vicinity of the site and the potential exists for future residential development of the site, so current and future residents may be exposed to surface water while recreating in the creek.
						Dermal	On-Site	Quant	Residents currently live in the vicinity of the site and the potential exists for future residential development of the site, so current and future residents may be exposed to surface water while recreating in the creek.

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SELECTION OF EXPOSURE PATHWAYS
Roebling Steel Company Superfund Site

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
		Air	Water Vapors at Shower-head	Residents	Adult	Inhalation	On-Site	None	The creek is not a potable source of water, so it is assumed that the pathway cannot be completed.
					Child	Inhalation	On-Site	None	The creek is not a potable source of water, so it is assumed that the pathway cannot be completed.
	Crafts Creek Surface Water	Fish Tissue	Fish from Crafts Creek	Residents	Adult	Fish Ingestion	On-Site	Quant	It is assumed that there are contaminants in the fish.
					Child	Fish Ingestion	On-Site	Quant	It is assumed that there are contaminants in the fish.

Table 29.1

Ecological Exposure Pathways of Concern

Exposure Medium	Sensitive Environment Flag (Y or N)	Receptor	Endangered/ Threatened Species Flag (Y or N)	Exposure Routes	Assessment Endpoints	Measurement Endpoints
Delaware River - Sediment	N	Benthic organisms	N	Ingestion, respiration, and direct contact with chemicals in sediments	Benthic invertebrate community species diversity and abundance	- Toxicity of sediments to Hyallela and Chironomus - Benthic species diversity
	N	Fish	Y	Ingestion, respiration, and direct contact with chemicals in sediments	Maintenance of an abundant and productive fish population	Comparison of body burden levels of contaminants to adverse effects thresholds
	N	Piscivorous Wildlife	Y	Ingestion of chemicals in sediments and fish	Protection of avian fauna exposed to contaminants in impacted media	Comparison of estimated exposure dosages of contaminants to NOAELS and LOAELS
Crafts Creek - Sediment	N	Benthic organisms	N	Ingestion, respiration, and direct contact with chemicals in sediments	Benthic invertebrate community species diversity and abundance	- Toxicity of sediments to Hyallela and Chironomus - Benthic species diversity
	N	Fish	Y	Ingestion, respiration, and direct contact with chemicals in sediments	Maintenance of an abundant and productive fish population	Comparison of body burden levels of contaminants to adverse effects thresholds
	N	Piscivorous Wildlife	Y	Ingestion of chemicals in sediments and fish	Protection of avian fauna exposed to contaminants in impacted media	Comparison of estimated exposure dosages of contaminants to NOAELS and LOAELS

TABLE 30.1
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil
Receptor Population: Trespasser
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	SC	Soil Concentration	mg/kg	See Table 3.1		See Table 3.1		Chronic Daily Intake (CDI) (mg/kg-day) (Carcinogenic) = SC x SI x (Bioavail./BW) x (EF/365 days) x (Yrs. Exp./70 years) x 10^{-6}kg/mg
	SI	Soil Ingestion Rate	mg/day	100	(3)	100	(3)	
	Bioavail.	Bioavailability Factor		1.0	(3)	0.5	(3)	CDI (mg/kg-day) (Non-Carcinogenic) = SC x SI x (Bioavail./BW) x (EF/365 days) x 10^{-6}kg/mg
	BW	Body Weight	kg	61.2	(3)	61.2	(3)	
	EF	Number of Exposure Events Per Year	days per year	110	(3)	110	(3)	
	70 years	Average Adult Lifetime	years	70	(3)	70	(3)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	7	(3)	7	(3)	
Dermal	SC	Soil Concentration	mg/kg	See Table 3.1		See Table 3.1		CDI (mg/kg-day) (Carcinogenic) = SC x SA x (Bioavail./BW) x AdhF x (# Events/365 days) x (Yrs. Exp./70 years) x 10-6kg/mg
	SA	Skin Surface Area	cm^2	4,000	(3)	4,000	(3)	
	BW	Body Weight	kg	61.2	(3)	61.2	(3)	CDI (mg/kg-day) (Non-Carcinogenic) = SC x SA x (Bioavail./BW) x AhdFx (# Events/365 days) x 10-6kg/mg
	70 years	Average Adult Lifetime	years	70	(3)	70	(3)	
	Bioavail.	Bioavailability Factor	percent	Chemical Specific	(3)	Chemical Specific	(3)	
	# Events	Number of Exposure Events Per Year	days per year	110	(3)	110	(3)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	7	(3)	7	(3)	
	AdhF	Soil to skin adherence factor	mg/cm^2 - event	0.2	(3)	0.2	(3)	

TABLE 30.1
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Current Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Surface Soil Receptor Population: Trespasser Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	SC	Soil Concentration	mg/kg	See Table 3.1		See Table 3.1		CDI (mg/kg-day) (Carcinogenic) = SC x SSF x IR x (Bioavail./BW) x (EF/365 days) x 10^{-6}kg/mg x (Yrs. Exp./70 Years)
	SSF	Suspended Soil Factor	kg/m^3	1.44x10^{-9}		1.44x10^{-9}		
	IR	Inhalation Rate	m^3/hour	0.9	(3)	0.6	(3)	CDI (mg/kg-day) (Non-Carcinogenic) = SC x SSF X IR x (Bioavail./BW) x (# Events/365 days) x 10^{-6}kg/mg
	BW	Body Weight	kg	61.2	(3)	61.2	(3)	
	70 years	Average Adult Lifetime	years	70	(3)	70	(3)	
	Hours/Day	Number of Hours Exposed to the Contaminant Per Day	hours/day	24	(3)	12 .	(3)	
	Bioavail.	Bioavailability Factor		1.0	(3)	0.25[2]	(3)	
	EF	Number of Exposure Events Per Year	days per year	110	(3)	110	(3)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	7	(3)	7	(3)	

(1) The SSF was calculated from high-volume sample data obtained at the site.
(2) The arsenic bioavailability factor for the average case is 0.75.
(3) Sources: EFH, 1997: Exposure Factors Handbook.
EPA, 1989a: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
ORD, 1992a: Dermal Exposure Assessment: Principles and Applications, EPA/600/8-91/011B
NCEA, 1998d: Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual. Supplemental Guidance Dermal Risk Assessment Interim Guidance. External Review Draft May 12, 1998 NCEA-W-0364.
Schaum, 1986:
Yang et al. 1986:
Polger and Schlatter, 1980:
McConnell et al. 1984:
Lucier et al. 1986:
EPA - DEAPA

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TABLE 30.2
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Current
Medium: Air Particulates
Exposure Medium: Downwind Air Particulates
Exposure Point: Air Particulates
Receptor Population: Downwind Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	AC	Air Concentration	ug/m3	See Table 3.8		See Table 3.8		Chronic Daily Intake (CDI) (mg/kg-day) (Carcinogenic) = AC x IR x Hours x (Bioavail./BW) x (EF/365 days) x (Yrs. Exp./70 Years)
	IR	Inhalation Rate	m^3/hour	0.9	(3)	0.6	(3)	
	BW	Body Weight	kg	70	(3)	70	(3)	CDI (mg/kg-day) (Non-Carcinogenic) = AC x IR x Hours x (Bioavail./BW) x (EF/365 days)
	70 years	Average Adult Lifetime	years	70	(3)	70	(3)	
	Bioavail.	Bioavailability Factor		1	(3)	0.25(2)	(3)	
	Hours	Number of Exposure Hours Per Day	hours per day	24	(3)	12	(3)	
	EF	Number of Exposure Events Per Year	days per year	110	(3)	110	(3)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	30	(3)	9	(3)	

(1) The SSC was calculated from high-volume sample data obtained at the site.
(2) The arsenic bioavailability factor for the average case is 0.75.
(3) Sources: EFH, 1997: Exposure Factors Handbook.
EPA, 1989a: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

TABLE 30.3
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Current
Medium: Air Particulates
Exposure Medium: Downwind Air Particulates
Exposure Point: Air Particulates
Receptor Population: Downwind Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	AC	Air Concentration	ug/m^3	See Table 3.8		See Table 3.8		Chronic Daily Intake (CDI) (mg/kg-day) (Carcinogenic) = AC x IR x Hours (Bioavail./BW) x (EF/365 days) x (Yrs. Exp./70 Years)
	IR	Inhalation Rate	m^3/hour	0.9	(2)	0.6	(2)	
	BW	Body Weight	kg	15	(2)	15	(2)	CDI (mg/kg-day) (Non-Carcinogenic) = AC x IR x Hours x (Bioavail./BW) x (EF/365 days)
	70 years	Average Adult Lifetime	years	70	(2)	70	(2)	
	Bioavail.	Bioavailability Factor		1	(2)	0.25[1]	(2)	
	EF	Number of Exposure Events Per Year	days per year	110	(2)	110	(2)	
	Hours	Number of Exposure Hours Per Day	hours per day	24	(2)	12	(2)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	6	(2)	6	(2)	

(1) The arsenic bioavailability factor for the average case is 0.75.

(2) Sources: EFH, 1997: Exposure Factors Handbook.

EPA, 1989a: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

TABLE 30.4
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	SC	Soil Concentration	mg/kg	See Table 3.1		See Table 3.1		Chronic Daily Intake (CDI) (mg/kg-day) (Carcinogenic) = SC x SI x (Bioavail./BW) x (EF/365 days) x (Yrs. Exp./70 years) x 10^{-6}kg/mg
	SI	Soil Ingestion Rate	mg/day	100	(1)	100	(1)	
	Bioavail.	Bioavailability Factor		1	(1)	0.5	(1)	CDI (mg/kg-day) (Non-Carcinogenic) = SC x SI x (Bioavail./BW) x (EF/365 days) x 10^{-6}kg/mg
	BW	Body Weight	kg	70	(1)	70	(1)	
	EF	Number of Exposure Events Per Year	days per year	350	(1)	350	(1)	
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	30	(1)	9	(1)	
Dermal	SC	Soil Concentration	mg/kg	See Table 3.1		See Table 3.1		CDI (mg/kg-day) (Carcinogenic) = SC x SA x (Bioavail./BW) x AdhF x (# Events/365 days) x (Yrs. Exp./70 years) x 10-6kg/mg
	SA	Skin Surface Area	cm^2	5,700	(1)	5,700	(1)	
	BW	Body Weight	kg	70	(1)	70	(1)	CDI (mg/kg-day) (Non-Carcinogenic) = SC x SA x (Bioavail./BW) x AhdFx (# Events/365 days) x 10-6kg/mg
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	
	Bioavail.	Bioavailability Factor	percent	Chemical Specific	(1)	Chemical Specific	(1)	
	# Events	Number of Exposure Events Per Year	days per year	350	(1)	350	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	30	(1)	9	(1)	
	AdhF	Skin Soil deposition	mg/cm^2-event	.3	(1)	0.07	(1)	

(1) Sources: EPA, 1989a: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
EFH, 1997: Exposure Factors Handbook.
ORD, 1992a: Dermal Exposure Assessment: Principles and Applications, EPA/600/8-91/011B
NCEA, 1998d: Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual. Supplemental Guidance Dermal Risk Assessment Interim Guidance.
External Review Draft May 12, 1998 NCEA-W-0364.
Schaum, 1985:
Yang et al. 1986:
Poiger and Schlatter, 1980:
McConnell et al. 1984:
Lucier et al. 1986:

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TABLE 30.5
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	SC	Soil Concentration	mg/kg	See Table 3.1		See Table 3.1		Chronic Daily Intake (CDI) (mg/kg-day) (Carcinogenic) = SC x SI x (Bioavail./BW) x (EF/365 days) x (Yrs. Exp./70 years) x 10^{-6}kg/mg
	SI	Soil Ingestion Rate	mg/day	200	(1)	100	(1)	
	Bioavail.	Bioavailability Factor		1	(1)	0.5	(1)	CDI (mg/kg-day) (Non-Carcinogenic) = SC x SI x (Bioavail./BW) x (EF/365 days) x 10^{-6}kg/mg
	BW	Body Weight	kg	15	(1)	15	(1)	
	EF	Number of Exposure Events Per Year	days per year	350	(1)	350	(1)	
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	6	(1)	6	(1)	
Dermal	SC	Soil Concentration	mg/kg	See Table 3.1		See Table 3.1		CDI (mg/kg-day) (Carcinogenic) = SC x SA x (Bioavail./BW) x AdhF x (#Events/365 days) x (Yrs. Exp./70 years) x 10-6kg/mg
	SA	Skin Surface Area	cm^2	2,900	(1)	2,900	(1)	
	BW	Body Weight	kg	15	(1)	15	(1)	CDI (mg/kg-day) (Non-Carcinogenic) = SC x SA x (Bioavail./BW) x AhdFx (#Events/365 days) x 10-6kg/mg
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	
	Bioavail.	Bioavailability Factor	percent	Chemical Specific	(1)	Chemical Specific	(1)	
	# Events	Number of Exposure Events Per Year	days per year	350	(1)	350	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	6	(1)	6	(1)	
	AdhF	Soil to skin adherence factor	mg/cm^2 - event	0.2	(1)	0.2	(1)	

(1) Sources: EPA, 1989a: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
EFH, 1997: Exposure Factors Handbook.
ORD, 1992a: Dermal Exposure Assessment: Principles and Applications, EPA/600/8-91/011B
NCEA, 1998d: Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual. Supplemental Guidance Dermal Risk Assessment Interim Guidance. External Review Draft May 12, 1998 NCEA-W-0364.
Schaum, 1985:
Yang et al. 1986:
Polger and Schlatter, 1980:
McConnell et al. 1984:
Lucier et al. 1986:

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TABLE 30.6
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil
Receptor Population: Site Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	SC	Soil Concentration	mg/kg	See Table 3.1		See Table 3.1		Chronic Daily Intake (CDI) (mg/kg-day) (Carcinogenic) = SC x SI x (Bioavail./BW) x (EF/365 days) x (Yrs. Exp./70 years) x 10^{-6}kg/mg
	SI	Soil Ingestion Rate	mg/day	100	(1)	50	(1)	
	Bioavail.	Bioavailability Factor		1	(1)	0.5	(1)	CDI (mg/kg-day) (Non-Carcinogenic) = SC x SI x (Bioavail./BW) x (EF/365 days) x 10^{-6}kg/mg
	BW	Body Weight	kg	70	(1)	70	(1)	
	EF	Number of Exposure Events Per Year	days per year	250	(1)	219	(1)	
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	25	(1)	8	(1)	
Dermal	SC	Soil Concentration	mg/kg	See Table 3.1		See Table 3.1		CDI (mg/kg-day) (Carcinogenic) = SC x SA x (Bioavail./BW) x AdhF x (#Events/365 days) x (Yrs. Exp./70 years) x 10-6kg/mg
	SA	Skin Surface Area	cm^2	2,500	(1)	2,500	(1)	
	BW	Body Weight	kg	70	(1)	70	(1)	CDI (mg/kg-day) (Non-Carcinogenic) = SC x SA x (Bioavail./BW) x AhdF x (#Events/365 days) x 10-6kg/mg
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	
	Bioavail.	Bioavailability Factor	percent	Chemical Specific	(1)	Chemical Specific	(1)	
	# Events	Number of Exposure Events Per Year	days per year	250	(1)	219	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	25	(1)	8	(1)	
	AdhF	Soil to skin adherence factor	mg/cm^2 - event	0.3	(1)	0.07	(1)	

(1) Sources: EPA, 1989a: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
EFH, 1997: Exposure Factors Handbook.
ORD, 1992a: Dermal Exposure Assessment: Principles and Applications, EPA/600/8-91/011B
NCEA, 1998d: Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual. Supplemental Guidance Dermal Risk Assessment Interim Guidance. External Review Draft May 12, 1998 NCEA-W-0364.
Schaum, 1985:
Yang et al. 1986:
Poiger and Schlatter, 1980:
McConnell et al. 1984:
Lucier et al. 1986:

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TABLE 30.7
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	SC	Soil Concentration	mg/kg	See Table 3.1		See Table 3.1		Chronic Daily Intake (CDI) (mg/kg-day) (Carcinogenic) = SC x SI x (Bioavail./BW) x (EF/365 days) x (Yrs. Exp./70 years) x 10^{-6}kg/mg
	SI	Soil Ingestion Rate	mg/day	200	(3)	100	(3)	
	Bioavail.	Bioavailability Factor		1	(3)	0.5	(3)	CDI (mg/kg-day) (Non-Carcinogenic) = SC x SI x (Bioavail./BW) x (EF/365 days) x 10^{-6}kg/mg
	BW	Body Weight	kg	70	(3)	70	(3)	
	EF	Number of Exposure Events Per Year	days per year	250	(3)	210	(3)	
	70 years	Average Adult Lifetime	years	70	(3)	70	(3)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	2	(3)	1	(3)	
Dermal	SC	Soil Concentration	mg/kg	See Table 3.1		See Table 3.1		CDI (mg/kg-day) (Carcinogenic) = SC x SA x (Bioavail./BW) x AdhF x (#Events/365 days) x (Yrs. Exp./70 years) x 10-6kg/mg
	SA	Skin Surface Area	cm^2	2,600	(3)	2,500	(3)	
	BW	Body Weight	kg	70	(3)	70	(3)	CDI (mg/kg-day) (Non-Carcinogenic) = SC x SA x (Bioavail./BW) x AhdF x (#Events/365 days) x 10-6kg/mg
	70 years	Average Adult Lifetime	years	70	(3)	70	(3)	
	Bioavail.	Bioavailability Factor	percent	Chemical Specific	(3)	Chemical Specific	(3)	
	# Events	Number of Exposure Events Per Year	days per year	250	(3)	210	(3)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	2	(3)	1	(3)	
	AdhF	Soil to skin adherence factor	mg/cm^2 - event	0.3	(3)	0.07	(3)	

TABLE 30.7
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	SC	Soil Concentartion	mg/kg	See Table 3.1		See Table 3.1		CDI (mg/kg-day) (Carcinogenic) = SC x SSF x IR x (% Bioavail./BW) x (EF/365 days) x 10^{-6}kg/mg x (Yrs. Exp./70 Years)
	SSF	Suspended Soil Factor	Kg/m^3	$1.44X10^{-9}$	(1)	$1.44X10^{-9}$	(1)	
	IR	Inhalation Rate	m^3/hour	3	(3)	1.4	(3)	CDI (mg/kg-day) (Non-Carcinogenic) = SC x SSF x IR x (Bioavail./BW) x (EF/365 days) x 10^{-6}kg/mg
	BW	Body Weight	kg	70	(3)	70	(3)	
	70 years	Average Adult Lifetime	years	70	(3)	70	(3)	
	Hours/Day	Number of hours exposed to the Contaminant per Day	hours/day	8	(3)	8	(3)	
	Bioavail.	Bioavailability Factor		1	(3)	0.25[2]	(3)	
	# Events	Number of Exposure Events Per Year	days per year	250	(3)	210	(3)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	2	(3)	1	(3)	

(1) The SSF was calculated from high-volume sample data obtained at the site.
(2) The arsenic bioavailability factor for the average case is 0.75.
(3) Sources: EPA, 1989a: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
EFH, 1997: Exposure Factors Handbook.
ORD, 1992a: Dermal Exposure Assessment: Principles and Applications, EPA/600/8-91/011B
NCEA, 1998d: Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual. Supplemental Guidance Dermal Risk Assessment Interim Guidance. External Review Draft May 12, 1998 NCEA-W-0364.
Schaum, 1985:
Yang et al. 1986:
Polger and Schlatter, 1980:
McConnell et al. 1984:
Lucier et al. 1986:

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TABLE 30.8
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Subsurface Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	SC	Soil Concentration	mg/kg	See Table 3.2		See Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) (Carcinogenic) = SC x SI x (Bioavail./BW) x (EF/365 days) x (Yrs. Exp./70 years) x 10-6kg/mg
	SI	Soil Ingestion Rate	mg/day	100	(1)	100	(1)	
	Bioavail.	Bioavailability Factor		1	(1)	0.5	(1)	CDI (mg/kg-day) (Non-Carcinogenic) = SC x SI x (Bioavail./BW) x (EF/365 days) x 10-6kg/mg
	BW	Body Weight	kg	70	(1)	70	(1)	
	EF	Number of Exposure Events Per Year	days per year	350	(1)	350	(1)	
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	2	(1)	1	(1)	
Dermal	SC	Soil Concentration	mg/kg	See Table 3.2		See Table 3.2		CDI (mg/kg-day) (Carcinogenic) = SC x SA x (Bioavail./BW) x AdhF x (#Events/365 days) x (Yrs. Exp./70 years) x 10-6kg/mg
	SA	Skin Surface Area	cm^2	5,700	(1)	5,700	(1)	
	BW	Body Weight	kg	70	(1)	70	(1)	CDI (mg/kg-day) (Non-Carcinogenic) = SC x SA x (Bioavail./BW) x AhdF x (#Events/365 days) x 10-6kg/mg
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	
	Bioavail.	Bioavailability Factor	percent	Chemical Specific	(1)	Chemical Specific	(1)	
	# Events	Number of Exposure Events Per Year	days per year	350	(1)	350	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	2	(1)	1	(1)	
	AdhF	Soil to skin adherence factor	mg/cm^2 - event	0.3	(1)	0.07	(1)	

(1) Sources: EPA, 1989a: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
EFH, 1997: Exposure Factors Handbook.
ORD, 1992a: Dermal Exposure Assessment: Principles and Applications, EPA/600/8-91/011B
NCEA, 1998d: Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual. Supplemental Guidance Dermal Risk Assessment Interim Guidance. External Review Draft May 12, 1998 NCEA-W-0364.
Schaum, 1985:
Yang et al. 1986:
Poiger and Schlatter, 1980:
McConnell et al. 1984:
Lucier et al. 1986:

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TABLE 30.9
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Subsurface Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	SC	Soil Concentration	mg/kg	See Table 3.2		See Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) (Carcinogenic) = SC x SI x (Bioavail./BW) x (EF/365 days) x (Yrs. Exp./70 years) x 10^{-6}kg/mg
	SI	Soil Ingestion Rate	mg/day	200	(1)	100	(1)	
	Bioavail.	Bioavailability Factor		1	(1)	0.5	(1)	CDI (mg/kg-day) (Non-Carcinogenic) = SC x SI x (Bioavail./BW) x (EF/365 days) x 10^{-6}kg/mg
	BW	Body Weight	kg	15	(1)	15	(1)	
	EF	Number of Exposure Events Per Year	days per year	350	(1)	350	(1)	
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	2	(1)	1	(1)	
Dermal	SC	Soil Concentration	mg/kg	See Table 3.2		See Table 3.2		CDI (mg/kg-day) (Carcinogenic) = SC x SA x (Bioavail./BW) x AdhF x (#Events/365 days) x (Yrs. Exp./70 years) x 10-6kg/mg
	SA	Skin Surface Area	cm^2	2,900	(1)	2,900	(1)	
	BW	Body Weight	kg	15	(1)	15	(1)	CDI (mg/kg-day) (Non-Carcinogenic) = SC x SA x (Bioavail./BW) x AhdFx (#Events/365 days) x 10-6kg/mg
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	
	Bioavail.	Bioavailability Factor	percent	Chemical Specific	(1)	Chemical Specific	(1)	
	# Events	Number of Exposure Events Per Year	days per year	350	(1)	350	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	2	(1)	1	(1)	
	AdhF	Soil to skin adherence factor	mg/cm^2 - event	0.2	(1)	0.2	(1)	

(1) Sources: EPA, 1989a: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
EFH, 1976: Exposure Factors Handbook.
ORD, 1992a: Dermal Exposure Assessment: Principles and Applications, EPA/600/8-91/011B
NCEA, 1998d: Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual. Supplemental Guidance Dermal Risk Assessment Interim Guidance. External Review Draft May 12, 1998 NCEA-W-0364.
Schaum, 1985:
Yang et al. 1986:
Poiger and Schlatter, 1980:
McConnell et al. 1984:
Lucier et al. 1986:

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TABLE 30.10
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Subsurface Soil
Receptor Population: Site Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	SC	Soil Concentration	mg/kg	See Table 3.2		See Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) (Carcinogenic) = SC x SI x (Bioavail./BW) x (EF/365 days) x (Yrs. Exp./70 years) x 10^{-6}kg/mg
	SI	Soil Ingestion Rate	mg/day	100	(1)	[illegible]	(1)	
	Bioavail.	Bioavailability Factor		1	(1)	0.5	(1)	CDI (mg/kg-day) (Non-Carcinogenic) = SC x SI x (Bioavail./BW) x (EF/365 days) x 10^{-6}kg/mg
	BW	Body Weight	kg	70	(1)	70	(1)	
	EF	Number of Exposure Events Per Year	days per year	250	(1)	219	(1)	
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	2	(1)	1	(1)	
Dermal	SC	Soil Concentration	mg/kg	See Table 3.2		See Table 3.2		CDI (mg/kg-day) (Carcinogenic) = SC x SA x (Bioavail./BW) x AdhF x (#Events/365 days) x (Yrs. Exp./70 years) x 10-6kg/mg
	SA	Skin Surface Area	cm^2	2,500	(1)	2,500	(1)	
	BW	Body Weight	kg	70	(1)	70	(1)	CDI (mg/kg-day) (Non-Carcinogenic) = SC x SA x (Bioavail./BW) x AhdF x (#Events/365 days) x 10-6kg/mg
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	
	Bioavail.	Bioavailability Factor	percent	Chemical Specific	(1)	Chemical Specific	(1)	
	# Events	Number of Exposure Events Per Year	days per year	250	(1)	219	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	2	(1)	1	(1)	
	AdhF	Soil to skin adherence factor	mg/cm^2 - event	0.3	(1)	0.07	(1)	

(1) Sources: EPA, 1989a: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
EFH, 1997: Exposure Factors Handbook.
ORD, 1992a: Dermal Exposure Assessment: Principles and Applications, EPA/600/8-91/011B
NCEA, 1998d: Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual. Supplemental Guidance Dermal Risk Assessment Interim Guidance. External Review Draft May 12, 1998 NCEA-W-0364.
Schaum, 1985;
Yang et al. 1988;
Polger and Schlatter, 1980;
McConnell et al. 1984;
Lucier et al. 1986;

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TABLE 30.11
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Subsurface Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	SC	Soil Concentration	mg/kg	See Table 3.2		See Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) (Carcinogenic) = SC x SI x (Bioavail./BW) x (EF/365 days) x (Yrs. Exp./70 years) x 10^{-6}kg/mg
	SI	Soil Ingestion Rate	mg/day	200	(3)	100	(3)	
	Bioavail.	Bioavailability Factor		1	(3)	0.5	(3)	CDI (mg/kg-day) (Non-Carcinogenic) = SC x SI x (Bioavail./BW) x (EF/365 days) x 10^{-6}kg/mg
	BW	Body Weight	kg	70	(3)	70	(3)	
	EF	Number of Exposure Events Per Year	days per year	250	(3)	210	(3)	
	70 years	Average Adult Lifetime	years	70	(3)	70.	(3)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	2	(3)	1	(3)	
Dermal	SC	Soil Concentration	mg/kg	See Table 3.2		See Table 3.2		CDI (mg/kg-day) (Carcinogenic) = SC x SA x (Bioavail./BW) x AdhF x (# Events/365 days) x (Yrs. Exp./70 years) x 10-6kg/mg
	SA	Skin Surface Area	cm^2	2,500	(3)	2,500	(3)	
	BW	Body Weight	kg	70	(3)	70	(3)	CDI (mg/kg-day) (Non-Carcinogenic) = SC x SA x (Bioavail./BW) x AhdFx (# Events/365 days) x 10-6kg/mg
	70 years	Average Adult Lifetime	years	70	(3)	70	(3)	
	Bioavail.	Bioavailability Factor	percent	Chemical Specific	(3)	Chemical Specific	(3)	
	# Events	Number of Exposure Events Per Year	days per yar	250	(3)	210	(3)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	2	(3)	1	(3)	
	AdhF	Soil to skin adherence factor	mg/cm^2 - event	0.3	(3)	0.07	(3)	

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TABLE 30.11
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Subsurface Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	SC	Soil Concentration	mg/kg	See Table 3.2		See Table 3.2		CDI (mg/kg-day) (Carcinogenic) = SC x SSF x IR x (% Bioavail./BW) x (#Events/365 days) x 10^{-6}kg/mg x (Yrs. Exp./70 Years)
	SSF	Suspended Soil Factor	kg/m^3	1.44×10^{-9}	(1)	1.44×10^{-9}	(1)	
	IR	Inhalation Rate	m^3/hour	3	(3)	1.4	(3)	CDI (mg/kg-day) (Non-Carcinogenic) = SC x SSF x IR x (Bioavail./BW) x (#Events/365 days) x 10^{-6}kg/mg
	BW	Body Weight	kg	70	(3)	70	(3)	
	70 years	Average Adult Lifetime	years	70	(3)	70	(3)	
	Bioavail.	Bioavailability Factor		1	(3)	0.25[2]	(3)	
		Hours per Day	hrs/day	8	(3)	8		
	# Events	Number of Exposure Events Per Year	days per year	250	(3)	210	(3)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	2	(3)	1	(3)	

(1) The SSF was calculated from high-volume sample data obtained at the site.
(2) The arsenic bioavailability factor for the average case is 0.75.
(3) Sources: EPA, 1989a: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
EFH, 1997: Exposure Factors Handbook.
ORD, 1992: Dermal Exposure Assessment: Principles and Applications, EPA/600/8-91/011B
NCEA, 1998d: Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual. Supplemental Guidance Dermal Risk Assessment Interim Guidance. External Review Draft May 12, 1998 NCEA-W-0364.
Schaum, 1985:
Yang et al. 1986:
Poiger and Schlatter, 1980:
McConnell et al. 1984:
Lucier et al. 1986:

TABLE 30.12
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Current/Future
Medium: Delaware River Sediment
Exposure Medium: Sediment
Exposure Point: Sediment
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	SC	Soil Concentration	mg/kg	See Table 3.3		See Table 3.3		Chronic Daily Intake (CDI) (mg/kg-day) (Carcinogenic) = SC x SI x (Bioavail./BW) x (EF/365 days) x (Yrs. Exp./70 years) x 10^{-6}kg/mg
	SI	Soil Ingestion Rate	mg/day	100	(1)	25	(1)	CDI (mg/kg-day) (Non-Carcinogenic) = SC x SI x (Bioavail./BW) x (EF/365 days) x 10^{-6}kg/mg
	Bioavail.	Bioavailability Factor		1	(1)	0.5	(1)	
	BW	Body Weight	kg	70	(1)	70	(1)	
	EF	Number of Exposure Events Per Year	days per year	104	(1)	52	(1)	
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	30	(1)	9	(1)	
Dermal	SC	Soil Concentration	mg/kg	See Table 3.3		See Table 3.3		CDI (mg/kg-day) (Carcinogenic) = SC x SA x (Bioavail./BW) x AdhF x (#Events/365 days) x (Yrs. Exp./70 years) x 10-6kg/mg
	SA	Skin Surface Area	cm^2	1,490	(1)	1,310	(1)	
	BW	Body Weight	kg	70	(1)	70	(1)	CDI (mg/kg-day) (Non-Carcinogenic) = SC x SA x (Bioavail./BW) x AhdF x (#Events/365 days) x 10-6kg/mg
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	
	Bioavail.	Bioavailability Factor	percent	Chemical Specific	(1)	Chemical Specific	(1)	
	# Events	Number of Exposure Events Per Year	days per year	104	(1)	52	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	30	(1)	9	(1)	
	AdhF	Soil to skin adherence factor	mg/cm^2 - event	0.3	(1)	0.3	(1)	

(1) Sources: EPA, 1989a: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EFH, 1997: Exposure Factors Handbook.

ORD, 1992a: Dermal Exposure Assessment: Principles and Applications, EPA/600/8-91/011B

NCEA, 1998d: Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual. Supplemental Guidance Dermal Risk Assessment Interim Guidance. External Review Draft May 12, 1998 NCEA-W-0364.

Schaum, 1985:
Yang et al. 1986:
Poiger and Schlatter, 1980:
McConnell et al. 1984:
Lucier et al. 1986:

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TABLE 30.13
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Current/Future
Medium: Delaware River Sediment
Exposure Medium: Sediment
Exposure Point: Sediment
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	SC	Soil Concentration	mg/kg	See Table 3.3		See Table 3.3		Chronic Daily Intake (CDI) (mg/kg-day) (Carcinogenic) = SC x SI x (Bioavail./BW) x (EF/365 days) x (Yrs. Exp./70 years) x 10^{-6}kg/mg
	SI	Soil Ingestion Rate	mg/day	100	(1)	25	(1)	
	Bioavail.	Bioavailability Factor		1.0		0.5		CDI (mg/kg-day) (Non-Carcinogenic) = SC x SI x (Bioavail./BW) x (EF/365 days) x 10^{-6}kg/mg
					(1)		(1)	
	BW	Body Weight	kg	15	(1)	15	(1)	
	EF	Number of Exposure Events Per Year	days/year	104	(1)	52	(1)	
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years/lifetime	6	(1)	6	(1)	
Dermal	SC	Soil Concentration	mg/kg	See Table 3.3		See Table 3.3		CDI (mg/kg-day) (Carcinogenic) = SC x SA x (Bioavail./BW) x AdhF x (# Events/365 days) x (Yrs. Exp./70 years) x 10-6kg/mg
	SA	Skin Surface Area	cm^2	1,010	(1)	881	(1)	
	BW	Body Weight	kg	15	(1)	15	(1)	CDI (mg/kg-day) (Non-Carcinogenic) = SC x SA x (Bioavail./BW) x AhdF x (# Events/365 days) x 10-6kg/mg
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	
	Bioavail.	Bioavailability Factor	percent	Chemical Specific	(1)	Chemical Specific	(1)	
	# Events	Number of Exposure Events Per Year	days per year	104	(1)	52	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	6	(1)	6	(1)	
	AdhF	Soil to skin adherence factor	mg/cm^2 - event	2.7	(1)	0.2	(1)	

(1) Sources: EPA, 1989a: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EFH, 1997: Exposure Factors Handbook.

ORD, 1992: Dermal Exposure Assessment: Principles and Applications, EPA/600/8-91/011B

NCEA, 1998d: Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual. Supplemental Guidance Dermal Risk Assessment Interim Guidance. External Review Draft May 12, 1998 NCEA-W-0364.

Schaum, 1985:
Yang et al. 1986:
Poiger and Schlatter, 1980:
McConnell et al. 1984:
Lucier et al. 1986:

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TABLE 30.14
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Current/Future
Medium: Crafts Creek Sediment
Exposure Medium: Sediment
Exposure Point: Sediment
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	SC	Soil Concentration	mg/kg	See Table 3.4		See Table 3.4		Chronic Daily Intake (CDI) (mg/kg-day) (Carcinogenic) = SC x SI x (Bioavail./BW) x (EF/365 days) x (Yrs. Exp./70 years) x 10^{-6}kg/mg
	SI	Soil Ingestion Rate	mg/day	100	(1)	25	(1)	CDI (mg/kg-day) (Non-Carcinogenic) = SC x SI x (Bioavail./BW) x (EF/365 days) x 10^{-6}kg/mg
	Bioavail.	Bioavailability Factor		1	(1)	0.6	(1)	
	BW	Body Weight	kg	70	(1)	70	(1)	
	EF	Number of Exposure Events Per Year	days per year	104	(1)	52	(1)	
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	30	(1)	9	(1)	
Dermal	SC	Soil Concentration	mg/kg	See Table 3.4		See Table 3.4		CDI (mg/kg-day) (Carcinogenic) = SC x SA x (Bioavail./BW) x AdhF x (# Events/365 days) x (Yrs. Exp./70 years) x 10-6kg/mg
	SA	Skin Surface Area	cm^2	1,490	(1)	1,310	(1)	CDI (mg/kg-day) (Non-Carcinogenic) = SC x SA x (Bioavail./BW) x AhdF x (# Events/365 days) x 10-6kg/mg
	BW	Body Weight	kg	70	(1)	70	(1)	
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	
	Bioavail.	Bioavailability Factor	percent	Chemical Specific	(1)	Chemical Specific	(1)	
	# Events	Number of Exposure Events Per Year	days per year	104	(1)	52	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	30	(1)	9	(1)	
	AdhF	Soil to skin adherence factor	mg/cm^2 - event	0.3	(1)	0.3	(1)	

(1) Sources: EPA, 1989a: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EFH, 1997: Exposure Factors Handbook.

ORD, 1992a: Dermal Exposure Assessment: Principles and Applications, EPA/600/8-91/011B

NCEA, 1998d: Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual. Supplemental Guidance Dermal Risk Assessment Interim Guidance. External Review Draft May 12, 1998 NCEA-W-0364.

Schaum, 1985:

Yang et al. 1986:

Poiger and Schlatter, 1980:

McConnell et al. 1984:

Lucier et al. 1986:

TABLE 30.15
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Current/Future
Medium: Crafts Creek Sediment
Exposure Medium: Sediment
Exposure Point: Sediment
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	SC	Soil Concentration	mg/kg	See Table 3.4		See Table 3.4		Chronic Daily Intake (CDI) (mg/kg-day) (Carcinogenic) = SC x SI x (Bioavail./BW) x (EF/365 days) x (Yrs. Exp./70 years) x 10^{-6}kg/mg
	SI	Soil Ingestion Rate	mg/day	100	(1)	25	(1)	CDI (mg/kg-day) (Non-Carcinogenic) = SC x SI x (Bioavail./BW) x (EF/365 days) x 10^{-6}kg/mg
	Bioavail.	Bioavailability Factor		1.0	(1)	0.5	(1)	
	BW	Body Weight	kg	15	(1)	15	(1)	
	EF	Number of Exposure Events Per Year	days/year	104	(1)	52	(1)	
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years/lifetime	6	(1)	6	(1)	
Dermal	SC	Soil Concentration	mg/kg	See Table 3.4		See Table 3.4		CDI (mg/kg-day) (Carcinogenic) = SC x SA x (Bioavail./BW) x AdhF x (# Events/365 days) x (Yrs. Exp./70 years) x 10-6kg/mg
	SA	Skin Surface Area	cm^2	4,130	(1)	3,590	(1)	
	BW	Body Weight	kg	15	(1)	15	(1)	CDI (mg/kg-day) (Non-Carcinogenic) = SC x SA x (Bioavail./BW) x AhdF x (# Events/365 days) x 10-6kg/mg
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	
	Bioavail.	Bioavailability Factor	percent	Chemical Specific	(1)	Chemical Specific	(1)	
	# Events	Number of Exposure Events Per Year	days per year	104	(1)	52	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	6	(1)	6	(1)	
	AdhF	Soil to skin adherence factor	mg/cm^2 - event	2.7	(1)	0.2	(1)	

(1) Sources: EPA, 1989a: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EFH, 1997: Exposure Factors Handbook.

ORD, 1992a: Dermal Exposure Assessment: Principles and Applications, EPA/600/8-91/011B

NCEA, 1998d: Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual. Supplemental Guidance Dermal Risk Assessment Interim Guidance. External Review Draft May 12, 1998 NCEA-W-0364.

Schaum, 1985:
Yang et al. 1986:
Poiger and Schlatter, 1980:
McConnell et al. 1984:
Lucier et al. 1986:

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TABLE 30.16
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Current/Future
Medium: Delaware River Surface Water
Exposure Medium: Surface Water
Exposure Point: Tap Water
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	WC	Water Concentration	mg/L	See Table 3.5		See Table 3.5		Chronic Daily Intake (CDI) (mg/kg-day) (Carcinogenic) = WC x DI x (Bioavail./BW) x (EF/365 days) x (Yrs. Exp./70 years)
	DI	Daily ingestion rate	L/day	2	(1)	1.4	(1)	
	EF	Exposure Frequency	days per year	365	(1)	350	(1)	CDI (mg/kg-day) (Non-Carcinogenic) = WC x DI x (Bioavail./BW) x (EF/365 days)
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	30	(1)	9	(1)	
	BW	Body weight	kg	70	(1)	70	(1)	
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	
	Bioavail.	Bioavailability Factor		1.0	(1)	1.0	(1)	
Dermal	WC	Water Concentration (semi-volatiles)	mg/L	See Table 3.5		See Table 3.5		CDI (mg/kg-day) (Carcinogenic) = WC x DP x (SSA/BW) x 10-3 x (# Events/365 days) x (Yrs. Exp./70 years) x hours/event
	BW	Body Weight	kg	70	(1)	70	(1)	
	# Events	Number of Exposure Events Per Year	days per year	365	(1)	350	(1)	CDI (mg/kg-day) (Noncarcinogenic) = WC x DP x (SSA/BW) x 10-3 L/cm3 x (# Events/365 days) x hours/event
	ET	Number of Exposure Hours Per Day	hours per day	0.2	(1)	0.13	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	30	(1)	9	(1)	
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	
	DP	Dermal Permeability constant for the subject contaminant	cm/hr	Chemical Specific	(1)	Chemical Specific	(1)	
	SSA	Skin Surface Area	cm^2	18,200	(1)	18,200	(1)	

(1) Sources: EFH, 1997: Exposure Factors Handbook.

EPA, 1989a: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

ORD, 1992a: Dermal Exposure Assessment: Principles and Applications, EPA/600/8-91/011B

NCEA, 1998d: Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual. Supplemental Guidance Dermal Risk Assessment Interim Guidance. External Review Draft May 12, 1998 NCEA-W-0364.

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TABLE 30.17
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Current/Future
Medium: Delaware River Surface Water
Exposure Medium: Surface Water
Exposure Point: Tap Water
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	WC	Water Concentration	mg/L	See Table 3.5		See Table 3.5		Chronic Daily Intake (CDI) (mg/kg-day) (Carcinogenic) = WC x DI x (Bioavail./BW) x (EF/365 days) x (Yrs. Exp./70 years)
	DI	Daily ingestion rate	L/day	1.0	(1)	0.6	(1)	
	BW	Body weight	kg	15	(1)	15	(1)	CDI (mg/kg-day) (Non-Carcinogenic) = WC x DI x (Bioavail./BW) x (EF/365 days)
	EF	Number of Exposure Events Per Year	days per year	365	(1)	350	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	6	(1)	6	(1)	
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	
	Bioavail.	Bioavailability Factor		1.0	(1)	1.0	(1)	
Dermal	WC	Water Concentration (semi-volatiles)	mg/L	See Table 3.5		See Table 3.5		CDI (mg/kg-day) (Carcinogenic) = WC x DP x (SSA/BW) x 10-3 x (# Events/365 days) x (Yrs. Exp./70 years) x hours/event
	BW	Body Weight	kg	15	(1)	15	(1)	
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	CDI (mg/kg-day) (Noncarcinogenic) = WC x DP x (SSA/BW) x 10-3 L/cm3 x (# Events/365 days) x hours/event
	ET	Number of Exposure Hours Per Day	hours per day	0.2	(1)	0.13	(1)	
	# Events	Number of Exposure Events Per Year	days per year	365	(1)	350	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	6	(1)	6	(1)	
	DP	Dermal Permeability constant for the subject contaminant	cm/hr	Chemical Specific	(1)	Chemical Specific	(1)	
	SSA	Skin Surface Area	cm^2	7,640	(1)	6,640	(1)	

(1) Sources: EFH, 1997: Exposure Factors Handbook.

EPA, 1989a: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

ORD, 1992a: Dermal Exposure Assessment: Principles and Applications, EPA/600/8-91/011B

NCEA, 1998d: Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual. Supplemental Guidance Dermal Risk Assessment Interim Guidance.

External Review Draft May 12, 1998 NCEA-W-0364.

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TABLE 30.18
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Current/Future
Medium: Delaware River Surface Water
Exposure Medium: Air
Exposure Point: Water Vapors at Showerhead
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	AC	Air Concentration (volatiles)	mg/m^3	See Table 3.5		See Table 3.5		Chronic Daily Intake (CDI) (mg/kg-day) (Carcinogenic) = AC x Bioavail. (100%) x (IR/BW) x (# Events/365 days) x (Yrs. Exp./70 years)
	IR	Inhalation Rate	m^3/hour	1.0	(1)	1.0	(1)	
	BW	Body Weight	kg	70	(1)	70	(1)	
	ET	Number of Exposure Hours Per Day	hours per day	0.2	(1)	0.13	(1)	
	# Events	Number of Exposure Events Per Year	days per year	365	(1)	350	(1)	CDI (mg/kg-day) (Non-Carcinogenic) = AC x Bioavail. x (IR/BW) x (# Events/365 days)
	ET	Number of Exposure Hours Per Day	hours per day	0.2	(1)	0.13	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	30	(1)	9	(1)	
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	
	Bioavail.	Bioavailability Factor		1.0	(1)	1.0	(1)	

(1) Sources: EFH, 1997: Exposure Factors Handbook.

EPA, 1989a: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

S.A. Foster and P. C. Chrostowski, 1987 "Inhalation Exposures to Volatile Organic Contaminants in the Shower"

TABLE 30.19
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Current/Future
Medium: Delaware River Surface Water
Exposure Medium: Air
Exposure Point: Water Vapors at Showerhead
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	AC	Air Concentration (volatiles)	mg/m^3	See Table 3.5		See Table 3.5		Chronic Daily Intake (CDI) (mg/kg-day) (Carcinogenic) = AC x Bioavail. (100%) x (IR/BW) x (# Events/365 days) x (Yrs. Exp./70 years)
	IR	Inhalation Rate	m^3/hour	1.0	(1)	1.0	(1)	
	BW	Body Weight	kg	15	(1)	15	(1)	
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	CDI (mg/kg-day) (Non-Carcinogenic) = AC x Bioavail. x (IR/BW) x (# Events/365 days)
	ET	Number of Exposure Hours Per Day	hours per day	0.2	(1)	0.13	(1)	
	# Events	Number of Exposure Events Per Year	days per year	365	(1)	350	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	6	(1)	6	(1)	
	Bioavail.	Bioavailability Factor		1.0	(1)	1.0	(1)	

(1) Sources: EFH, 1997: Exposure Factors Handbook.

EPA, 1989a: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

S.A. Foster and P. C. Chrostowski, 1987 "Inhalation Exposures to Volatile Organic Contaminants in the Shower"

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TABLE 30.20
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Current/Future
Medium: Crafts Creek Surface Water
Exposure Medium: Surface Water
Exposure Point: Surface Water
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	WC	Water Concentration	mg/L	See Table 3.6		See Table 3.6		Chronic Daily Intake (CDI) (mg/kg-day) (Carcinogenic) = WC x DI x (% Bioavail./BW) x (EF/365 days) x (Yrs. Exp./70 years)
	DI	Daily Ingestion rate	L/day	0.1	(1)	0.1	(1)	
	EF	Number of Exposure Events Per Year	days per year	104	(1)	52	(1)	CDI (mg/kg-day) (Non-Carcinogenic) = WC x DI x (Bioavail./BW) x (EF/365 days)
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	30	(1)	9	(1)	
	BW	Body weight	kg	70	(1)	70	(1)	
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	
	Bioavail.	Bioavailability Factor		1	(1)	1	(1)	
Dermal	WC	Water Concentration (semi-volatiles)	mg/L	See Table 3.6		See Table 3.6		CDI (mg/kg-day) (Carcinogenic) = WC x DP x (SSA/BW) x 10-3 x (# Events/365 days) x (Yrs. Exp./70 years) x ET
	BW	Body Weight	kg	70	(1)	70	(1)	
	# Events	Number of Exposure Events Per Year	days per year	104	(1)	52	(1)	CDI (mg/kg-day) (Noncarcinogenic) = WC x DP x (SSA/BW) x 10-3 L/cm3 x (# Events/365 days) x ET
	ET	Number of Exposure Hours Per Day	hours/day	2	(1)	1	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	30	(1)	9	(1)	
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	
	DP	Dermal Permeability constant for the subject contaminant	cm/hr	Chemical Specific	(1)	Chemical Specific	(1)	
	SSA	Skin Surface Area	cm^2	8,600	(1)	8,600	(1)	

(1) Sources: EFH, 1997: Exposure Factors Handbook.

EPA, 1989a: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

ORD, 1992a: Dermal Exposure Assessment: Principles and Applications, EPA/600/8-91/011B

NCEA, 1998d: Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual. Supplemental Guidance Dermal Risk Assessment Interim Guidance. External Review Draft May 12, 1998 NCEA-W-0364.

TABLE 30.21
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Current/Future
Medium: Crafts Creek Surface Water
Exposure Medium: Surface Water
Exposure Point: Surface Water
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	WC	Water Concentration	mg/L	See Table 3.6		See Table 3.6		Chronic Daily Intake (CDI) (mg/kg-day) (Carcinogenic) = WC x DI x (% Bioavail./BW) x (EF/365 days) x (Yrs. Exp./70 years)
	DI	Daily Ingestion rate	L/day	0.1	(1)	0.1	(1)	
	BW	Body weight	kg	15	(1)	15	(1)	CDI (mg/kg-day) (Non-Carcinogenic) = WC x DI x (Bioavail./BW) x (EF/365 days)
	Hours	Number of Exposure Hours Per Day	hours per day	2	(1)	1	(1)	
	EF	Number of Exposure Events Per Year	days per year	104	(1)	52	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	6	(1)	6	(1)	
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	
	Bioavail.	Bioavailability Factor		1.0	(1)	1.0	(1)	
Dermal	WC	Water Concentration	mg/L	See Table 3.6		See Table 3.6		CDI (mg/kg-day) (Carcinogenic) = WC x DP x (SSA/BW) x 10-3 x (# Events/365 days) x (Yrs. Exp./70 years) x hours/event
	BW	Body Weight	kg	15	(1)	15	(1)	
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	CDI (mg/kg-day) (Noncarcinogenic) = WC x DP x (SSA/BW) x 10-3 L/cm3 x (# Events/365 days) x hours/event
	# Events	Number of Exposure Events Per Year	days per year	104	(1)	52	(1)	
	ET	Number of Exposure Hours Per Day	hours per day	2	(1)	1	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	6	(1)	6	(1)	
	DP	Dermal Permeability constant for the subject contaminant	cm/hr	Chemical Specific	(1)	Chemical Specific	(1)	
	SSA	Skin Surface Area	cm^2	4,000		4,000		

(1) Sources: EFH, 1997: Exposure Factors Handbook.
EPA, 1989a: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
ORD, 1992a: Dermal Exposure Assessment: Principles and Applications, EPA/600/8-91/011B
NCEA, 1998d: Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual. Supplemental Guidance Dermal Risk Assessment Interim Guidance.
External Review Draft May 12, 1998 NCEA-W-0364.

TABLE 30.22
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Current/Future
Medium: Consumable Fish
Exposure Medium: Animal Tissue
Exposure Point: Fish from Crafts Creek
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	FC	Concentration of Chemical in Fish Tissue	mg/kg	See Table 3.7		See Table 3.7		Chronic Daily Intake (CDI) (mg/kg-day) (Carcinogenic) = FC x FI x (Bioavail./BW) x (EF/365 days) x (Yrs. Exp./70 years) x 10^{-3}kg/g
	FI	Fish Ingestion Rate	g/meal	54	(1)	20	(1)	
	BW	Body Weight	kg	70	(1)	70	(1)	CDI (mg/kd-day) (Non-Carcinogenic) = FC x FI x (Bioavail./BW) x (EF/365 days) x 10^{-3}kg/g
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	
	Bioavail.	Bioavailability Factor		1	(1)	1	(1)	
	EF	Number of Exposure Events Per Year	meals per year	365	(1)	52	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	30	(1)	9	(1)	

(1) Sources: EPA, 1989a: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
USDOC, 1990: United States Department of Commerce. *Fisheries of the United States*. (Based upon 1989 U.S. average fish consumption of 15.9 lbs/person/year.)

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TABLE 30.23
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Current/Future
Medium: Consumable Fish
Exposure Medium: Animal Tissue
Exposure Point: Fish from Crafts Creek
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	FC	Concentration of Chemical in Fish Tissue	mg/kg	See Table 3.7		See Table 3.7		Chronic Daily Intake (CDI) (mg/kg-day) (Carcinogenic) = FC x FI x (Bioavail./BW) x (EF/365 days) x (Yrs. Exp./70 years) x 10^{-3}kg/g
	FI	Fish Ingestion Rate (2)	g/meal	6	(1)	6	(1)	
	BW	Body Weight	kg	15	(1)	15	(1)	CDI (mg/kd-day) (Non-Carcinogenic) = FC x FI x (Bioavail./BW) x (EF/365 days) x 10^{-3}kg/g
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	
	Bioavail.	Bioavailability Factor		1	(1)	1	(1)	
	EF	Number of Exposure Events Per Year	meals per year	365	(1)	365	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	6	(1)	6	(1)	

(1) Sources: EPA, 1989a: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
USDOC, 1990: United States Department of Commerce. *Fisheries of the United States*. (Based upon 1989 U.S. average fish consumption of 15.9 lbs/person/year.)
(2) FWENC, 1998b, Personal communication November 4, 1998.

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TABLE 30.24
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Tap water
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	WC	Water Concentration	mg/L	See Table 3.9		See Table 3.9		CDI (Carcinogenic) = WC x DI x (% Bioavil./BW) x (EF/365 days) x (Yrs. Exp./70 years)
	DI	Daily Ingestion Rate	L/day	2.0	(1)	1.4	(1)	
	BW	Body Weight	kg	70	(1)	70	(1)	CDI (Noncarcinogenic) = WC x DI x (Bioavail./BW) x (EF/365 days)
	Bioavil.	Bioavailability		1	(1)	1	(1)	
	70 Yrs.	Average Adult Lifetime	years	70	(1)	70	(1)	
	EF	Number of Exposure Events Per Year	days/year	365	(1)	350	(1)	
	Yrs. Exp.	Number of Exposure Years Per Lifetime	years/lifetime	30	(1)	9	(1)	
Dermal	WC	Water Concentration	mg/L	See Table 3.9		See Table 3.9		CDI (mg/kg-day) (Carcinogenic) = WC x DP x (SSA/BW) x 10-3 x (# Events/365 days) x (Yrs. Exp./70 years) x ET
	DP	Dermal Permeability constant for the subject contaminant	cm/hr	Chemical Specific	(1)	Chemical specific	(1)	
	BW	Body Weight	kg	70	(1)	70	(1)	CDI (mg/kg-day) (Noncarcinogenic) = WC x DP x (SSA/BW) x 10-3 L/cm3 x (# Events/365 days) x ET
	Bioavil.	Bioavailability		1	(1)	1	(1)	
	# Events	Number of Exposure Events Per Year	days/year	365	(1)	350	(1)	
	70 Yrs.	Average Adult Lifetime	years	70	(1)	70	(1)	
	SSA	Skin Surface Area	cm^2	18,200	(1)	18,200	(1)	
	ET	Number of Exposure Hours Per Day	hours/day	0.2	(1)	0.13	(1)	
	Yrs. Exp.	Number of Exposure Years Per Lifetime	years/lifetime	30	(1)	9	(1)	

(1) Sources: EFH, 1997: Exposure Factors Handbook.
EPA, 1989a: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
ORD, 1992a: Dermal Exposure Assessment: Principles and Applications, EPA/600/8-91/011B
NCEA, 1998d: Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual. Supplemental Guidance Dermal Risk Assessment Interim Guidance.
External Review Draft May 12, 1998 NCEA-W-0364.

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TABLE 30.25
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Tap Water
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	WC	Water Concentration	mg/L	See Table 3.9		See Table 3.9		CDI (Carcinogenic) = WC x DI x (% Bioavil./BW) x (EF/365 days) x (Yrs. Exp./70 years)
	DI	Daily Ingestion Rate	L/day	1.0	(1)	0.6	(1)	
	BW	Body Weight	kg	15	(1)	15	(1)	CDI (Noncarcinogenic) = WC x DI x (Bioavail./BW) x (EF/365 days)
	Bioavil.	Bioavailability		1	(1)	1	(1)	
	70 Yrs.	Average Adult Lifetime	years	70	(1)	70	(1)	
	EF	Number of Exposure Events Per Year	days/year	365	(1)	350	(1)	
	Yrs. Exp.	Number of Exposure Years Per Lifetime	years/lifetime	6	(1)	6	(1)	
Dermal	WC	Water Concentration	mg/L	See Table 3.9		See Table 3.9		CDI (mg/kg-day) (Carcinogenic) = WC x DP x (SSA/BW) x 10-3 x (# Events/365 days) x (Yrs. Exp./70 years) x ET
	DP	Dermal Permeability constant for the subject contaminant	cm/hr	Chemical Specific	(1)	Chemical Specific	(1)	
	BW	Body Weight	kg	15	(1)	15	(1)	CDI (mg/kg-day) (Noncarcinogenic) = WC x DP x (SSA/BW) x 10-3 L/cm3 x (# Events/365 days) x ET
	Bioavil.	Bioavailability		1	(1)	1	(1)	
	# Events	Number of Exposure Events Per Year	days/year	365	(1)	350	(1)	
	70 Yrs.	Average Adult Lifetime	years	70	(1)	70	(1)	
	SSA	Skin Surface Area	cm^2	7,640	(1)	6,640	(1)	
	ET	Number of Exposure Hours Per Day	hours/day	0.2	(1)	0.13	(1)	
	Yrs. Exp.	Number of Exposure Years Per Lifetime	years/lifetime	6	(1)	6	(1)	

(1) Sources: EFH, 1997: Exposure Factors Handbook.

EPA, 1989a: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

ORD, 1992a: Dermal Exposure Assessment: Principles and Applications, EPA/600/8-91/011B

NCEA, 1998d: Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual. Supplemental Guidance Dermal Risk Assessment Interim Guidance. External Review Draft May 12, 1998 NCEA-W-0364.

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TABLE 30.26
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Tap Water
Receptor Population: Site Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	WC	Water Concentration	mg/L	See Table 3.9		See Table 3.9		CDI (Carcinogenic) = WC x DI x (% Bioavil./BW) x (EF/365 days) x (Yrs. Exp./70 years)
	DI	Daily Ingestion Rate	L/day	1.0	(1)	1.0	(1)	
	BW	Body Weight	kg	70	(1)	70	(1)	CDI (Noncarcinogenic) = WC x DI x (Bioavail./BW) x (EF/365 days)
	Bioavil.	Bioavailability		1	(1)	1	(1)	
	70 Yrs.	Average Adult Lifetime	years	70	(1)	70	(1)	
	EF	Number of Exposure Events Per Year	days/year	250	(1)	219	(1)	
	Yrs. Exp.	Number of Exposure Years Per Lifetime	years/lifetime	25	(1)	8	(1)	

(1) Sources: EFH, 1997: Exposure Factors Handbook.

EPA, 1989a: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

TABLE 30.27
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Water Vapors at Showerhead
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	AC	Air Concentration (volatiles)	mg/m^3	See Table 3.10		See Table 3.10		Chronic Daily Intake (CDI) (mg/kg-day) (Carcinogenic) = AC x Bioavail. (100%) x (IR/BW) x (# Events/365 days) x (Yrs. Exp./70 years)
	IR	Inhalation Rate	m^3/hour	1.0	(1)	1.0	(1)	
	BW	Body Weight	kg	70	(1)	70	(1)	
	ET	Number of Exposure Hours Per Day	hours per day	0.2	(1)	0.13	(1)	
	# Events	Number of Exposure Events Per Year	days per year	365	(1)	350	(1)	CDI (mg/kg-day) (Non-Carcinogenic) = AC x Bioavail. x (IR/BW) x (# Events/365 days)
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	30	(1)	9	(1)	
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	
	Bioavail.	Bioavailability Factor		1.0	(1)	1.0	(1)	

(1) Sources: EFH, 1997: Exposure Factors Handbook.

EPA, 1989a: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

S.A. Foster and P. C. Chrostowski, 1987 "Inhalation Exposures to Volatile Organic Contaminants in the Shower"

TABLE 30.28
VALUES USED FOR DAILY INTAKE CALCULATIONS
Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Water Vapors at Showerhead
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	IR	Air Concentration (volatiles)	mg/m^3	See Table 3.10		See Table 3.10		Chronic Daily Intake (CDI) (mg/kg-day) (Carcinogenic) = AC x Bioavail. (100%) x (IR/BW) x (# Events/365 days) x (Yrs. Exp./70 years)
		Inhalation Rate	m3/hour	1.0	(1)	1.0	(1)	
	BW	Body Weight	kg	15	(1)	15	(1)	
	70 years	Average Adult Lifetime	years	70	(1)	70	(1)	CDI (mg/kg-day) (Non-Carcinogenic) = AC x Bioavail. x (IR/BW) x (# Events/365 days)
	ET	Number of Exposure Hours Per Day	hours per day	0.2	(1)	0.13	(1)	
	# Events	Number of Exposure Events Per Year	days per year	365	(1)	350	(1)	
	Yrs. Exp.	Number of Years Exposed to the Contaminant	years per lifetime	6	(1)	6	(1)	
	Bioavail.	Bioavailability Factor		1.0	(1)	1.0	(1)	

(1) Sources: EFH, 1997: Exposure Factors Handbook.

EPA, 1989a: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

S.A. Foster and P. C. Chrostowski, 1987 "Inhalation Exposures to Volatile Organic Contaminants in the Shower"

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TABLE 31
NON-CANCER TOXICITY DATA -- ORAL/DERMAL
Roebling Steel Company Superfund Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (MM/DD/YY)
Trichloroethene	Chronic	6.0E-03	mg/kg-day	100%	6.0E-03	mg/kg-day	-	-	EPA-NCEA provisional value	08/06/98
Bis(2-ethylhexyl)phthalate	Chronic	2.0E-02	mg/kg-day	100%	2.0E-02	mg/kg-day	liver	1000	IRIS	08/06/98
Pentachlorophenol	Chronic	3.0E-02	mg/kg-day	100%	3.0E-02	mg/kg-day	liver; kidney	100	IRIS	07/09/98
Hexachlorobenzene	Chronic	8.0E-04	mg/kg-day	100%	8.0E-04	mg/kg-day	liver	100	IRIS	07/09/98
2,4-Dinitrotoluene	Chronic	2.0E-03	mg/kg-day	100%	2.0E-03	mg/kg-day	neurotoxicity	100	IRIS	07/09/98
Dibenzofuran	Chronic	4.0E-03	mg/kg-day	100%	4.0E-03	mg/kg-day	-	-	EPA-NCEA provisional value	07/09/98
Acenaphthylene	-	-	-	-	-	-	-	-	-	07/09/98
Benzo(a)Pyrene	-	-	-	-	-	-	-	-	-	07/09/98
Benzo(g,h,i)perylene	-	-	-	-	-	-	-	-	-	07/09/98
Benzo(a)anthracene	-	-	-	-	-	-	-	-	-	07/09/98
Benzo(b)fluoranthene	-	-	-	-	-	-	-	-	-	07/09/98
Benzo(k)fluoranthene	-	-	-	-	-	-	-	-	-	07/09/98
Chrysene	-	-	-	-	-	-	-	-	-	07/09/98
Dibenz[a,h]anthracene	-	-	-	-	-	-	-	-	-	07/09/98
Indeno(1,2,3-cd)pyrene	-	-	-	-	-	-	-	-	-	07/09/98
Phenanthrene	-	-	-	-	-	-	-	-	-	07/09/98
4,4'-DDD	-	-	-	-	-	-	-	-	IRIS	07/09/98
4,4'-DDE	-	-	-	-	-	-	-	-	IRIS	07/09/98
Aldrin	Chronic	3.0E-05	mg/kg-day	100%	3.0E-05	mg/kg-day	liver	1000	IRIS	07/09/98
Dieldrin	Chronic	5.0E-05	mg/kg-day	100%	5.0E-05	mg/kg-day	liver	100	IRIS	07/09/98
Endosulfan Sulfate	-	-	-	-	-	-	-	-	-	07/09/98
Endrin Aldehyde	-	-	-	-	-	-	-	-	-	07/09/98
Endrin Ketone	-	-	-	-	-	-	-	-	-	07/09/98
Heptachlor Epoxide	Chronic	1.3E-05	mg/kg-day	100%	1.3E-05	mg/kg-day	liver	1000	IRIS	07/09/98
Aroclor 1242	-	-	-	-	-	-	-	-	-	07/09/98
Aroclor 1248	-	-	-	-	-	-	-	-	-	07/09/98
Aroclor 1254	Chronic	2.0E-05	mg/kg-day	100%	2.0E-05	mg/kg-day	eye	300	IRIS	07/09/98
Aroclor 1260	-	-	-	-	-	-	-	-	-	07/09/98
Barium	Chronic	7.0E-02	mg/kg-day	100%	7.0E-02	mg/kg-day	kidney	3	IRIS	07/09/98
Manganese	Chronic	1.40E-01(4)	mg/kg-day	100%	1.40E-01(4)	mg/kg-day	CNS	1	IRIS	07/09/98
Antimony	Chronic	4.0E-04	mg/kg-day	100%	4.0E-04	mg/kg-day	longevity, blood glucose, cholesterol	1000	IRIS	07/09/98
Arsenic	Chronic	3.0E-04	mg/kg-day	100%	3.0E-04	mg/kg-day	skin	3	IRIS	07/09/98
Beryllium	Chronic	2.0E-03	mg/kg-day	100%	2.0E-03	mg/kg-day	small intestines	300	IRIS	07/09/98
Cadmium	Chronic	1.00E-03(5)	mg/kg-day	100%	1.00E-03(5)	mg/kg-day	kidney	10	IRIS	07/09/98
Chromium	Chronic	5.00E-03(6)	mg/kg-day	100%	5.00E-03(6)	mg/kg-day	gastro-intestine	500	IRIS	07/23/98
Copper	Chronic	4.0E-02	mg/kg-day	100%	4.0E-02	mg/kg-day	gastro-intestine	-	HEAST	05/00/95
Lead	-	-	-	-	-	-	-	-	-	07/09/98
Mercury(7)	Chronic	3.0E-04	mg/kg-day	100%	3.0E-04	-	Immune System	1000	IRIS	07/09/98
Mercury(8)	Chronic	1.0E-04	mg/kg-day				fetal neuro-development adult paresthesia	10	IRIS	05/14/00

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TABLE 31
NON-CANCER TOXICITY DATA -- ORAL/DERMAL
Roebling Steel Company Superfund Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (MM/DD/YY)
Nickel	Chronic	2.0E-02	mg/kg-day	100%	2.0E-02	mg/kg-day	body weight	-	IRIS	07/09/98
Silver	Chronic	5.0E-03	mg/kg-day	100%	5.0E-03	mg/kg-day	skin	3	IRIS	08/03/98
Thallium	Chronic	7.0E-05	mg/kg-day	100%	7.0E-05	mg/kg-day	liver	-	IRIS	07/09/98
Vanadium	Chronic	7.0E-03	mg/kg-day	100%	7.0E-03	mg/kg-day	longevity	-	HEAST	05/00/95
Zinc	Chronic	3.0E-01	mg/kg-day	100%	3.0E-01	mg/kg-day	blood	100 3	IRIS	07/09/98

(1) Regional Guidance
(2) Dermal RfD = Oral RfD x GI Absorption (or the Oral/Dermal Adjustment Factor)
(3) Refers to the date the database (i.e. IRIS, HEAST) was searched for the RfD and target organ.
(4) RfD Value is for 'food' form of manganese.
(5) RfD Value is for 'food' form of cadmium.
(6) RfD Value is for Chromium VI.
(7) Mercuric Chloride was used for soils.
(8) Methyl Mercury was used for fish tissue.

Definitions:
IRIS = Integrated Risk Information System
HEAST = Health Effects Assessment Summary Tables
EPA = Environmental Protection Agency
NCEA = Superfund Health Risk Technical Support Center
CNS = Central Nervous System
- = Not Applicable/Not Available

Source:
IRIS, On-line July 1998c
HEAST, EPA 540R-95038, May 1995
NCEA

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TABLE 32
NON-CANCER TOXICITY DATA -- INHALATION
Roebling Steel Company Superfund Site

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Adjusted Inhalation RfD (1)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC:RfD: Target Organ	Dates (2) (MM/DD/YY)
Pentachlorophenol	-	-	-	-	-	-	-	-	07/09/98
Hexachlorobenzene	-	-	-	-	-	-	100	IRIS	07/09/98
2,4-Dinitrotoluene	-	-	-	-	-	-	100	IRIS	07/09/98
Dibenzofuran	-	-	-	-	-	-	-	EPA-NCEA provisional value	07/01/98
Acenaphthylene	-	-	-	-	-	-	-	-	07/09/98
Benzo(a)Pyrene	-	-	-	-	-	-	-	-	07/09/98
Benzo(g,h,i)perylene	-	-	-	-	-	-	-	-	07/09/98
Benzo(a)anthracene	-	-	-	-	-	-	-	-	07/09/98
Benzo(b)fluoranthene	-	-	-	-	-	-	-	-	07/09/98
Benzo(k)fluoranthene	-	-	-	-	-	-	-	-	07/09/98
Chrysene	-	-	-	-	-	-	-	-	07/09/98
Dibenz[a,h]anthracene	-	-	-	-	-	-	-	-	07/09/98
Indeno(1,2,3-cd)pyrene	-	-	-	-	-	-	-	-	07/09/98
Phenanthrene	-	-	-	-	-	-	-	-	07/09/98
Aldrin	-	-	-	-	-	-	-	IRIS	07/09/98
Dieldrin	-	-	-	-	-	-	-	IRIS	07/09/98
Endosulfan Sulfate	-	-	-	-	-	-	-	-	07/09/98
Endrin Aldehyde	-	-	-	-	-	-	-	-	07/09/98
Endrin Ketone	-	-	-	-	-	-	-	-	07/09/98
Heptachlor Epoxide	-	-	-	-	-	-	-	IRIS	07/09/98
Aroclor 1242	-	-	-	-	-	-	-	-	07/09/98
Aroclor 1248	-	-	-	-	-	-	-	-	07/09/98
Aroclor 1254	-	-	-	-	-	-	-	IRIS	07/09/98
Aroclor 1260	-	-	-	-	-	-	-	-	07/09/98
Barium	Chronic	4.9E-04	mg/m^3	1.4E-04	mg/kg-day	kidney	3	IRIS	07/09/98
Manganese	Chronic	5.0E-05	mg/m^3	1.4E-05	mg/kg-day	CNS	1000	HEAST	05/00/95
Antimony	-	-	-	-	-	-	-	-	07/09/98
Arsenic	-	-	-	-	-	-	-	-	07/09/98
Beryllium	Chronic	2.0E-05	mg/m^3	5.7E-06	mg/kg-day	lung	300	IRIS	07/09/98
Cadmium	-	-	-	-	-	-	-	IRIS	07/09/98
Chromium	Chronic	3.5E-07	mg/kg-day	1.0E-07	mg/kg-day	none	500	EPA-NCEA provisional value	07/23/98

TABLE 32
NON-CANCER TOXICITY DATA -- INHALATION
Roebling Steel Company Superfund Site

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Adjusted Inhalation RfD (1)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC:RfD: Target Organ	Dates (2) (MM/DD/YY)
Copper	-	-	-	-	-	-	-	HEAST	07/01/98
Lead	-	-	-	-	-	-	-	-	07/09/98
Nickel	-	-	-	-	-	-	-	IRIS	07/09/98
Silver	-	-	-	-	-	-	-	IRIS	08/03/98
Thallium	-	-	-	-	-	-	-	-	07/01/98
Vanadium	-	-	-	-	-			IRIS	07/23/98
Zinc	-	-	-	-	-	-	-	IRIS	07/09/98

(1) Inhalation RfD = (Inh RfC/70 kg) * (20 m^3/day)
(2) Refers to the date the database (i.e. IRIS, HEAST) was searched for the RfC and target organ.

Definitions:
- = Not Applicable/Not Available
IRIS = Integrated Risk Information System
HEAST = Health Effects Assessment Summary Tables
EPA = Environmental Protection Agency
NCEA = Superfund Health Risk Technical Support Center
CNS = Central Nervous System
- = Not Applicable/Not Available

Source:
IRIS, On-line July 1998c
HEAST, EPA 540R-95036, May 1995
NCEA

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TABLE 33
CANCER TOXICITY DATA – ORAL/DERMAL
Roebling Steel Company Superfund Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor	Adjusted Dermal Cancer Slope Factor (1)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (2) (MM/DD/YY)
Trichloroethene	1.1E-02	100%	1.1E-02	1/mg/kg/day	-	IRIS	08/05/98
Bis(2-ethylhexyl)phthalate	1.4E-02	100%	1.4E-02	1/mg/kg/day	B2	IRIS	08/05/98
Pentachlorophenol	1.2E-01	100%	1.2E-01	1/mg/kg/day	B2	IRIS	07/01/98
Hexachlorobenzene	1.6E+00	100%	1.6E+00	1/mg/kg/day	B2	IRIS	07/01/98
2,4-Dinitrotoluene	-	-	-	-	-	IRIS	07/01/98
Dibenzofuran	-	-	-	-	D	IRIS	07/01/98
Acenaphthylene	-	-	-	-	D	IRIS	07/01/98
Benzo(a)Pyrene	7.3E+00	100%	7.3E+00	1/mg/kg/day	B2	IRIS	07/01/98
Benzo(g,h,i)perylene	-	-	-	-	D	IRIS	07/01/98
Benzo(a)anthracene	7.3E-01	100%	7.3E-01	1/mg/kg/day	B2	IRIS	07/01/98
Benzo(b)fluoranthene	7.3E-01	100%	7.3E-01	1/mg/kg/day	B2	IRIS	07/01/98
Benzo(k)fluoranthene	7.3E-02	100%	7.3E-02	1/mg/kg/day	B2	IRIS	07/01/98
Chrysene	7.3E-03	100%	7.3E-03	1/mg/kg/day	B2	IRIS	07/01/98
Dibenz[a,h]anthracene	7.3E+00	100%	7.3E+00	1/mg/kg/day	B2	IRIS	07/01/98
Indeno(1,2,3-cd)pyrene	7.3E-01	100%	7.3E-01	1/mg/kg/day	B2	IRIS	07/01/98
Phenanthrene	-	-	-	-	D	IRIS	07/01/98
4,4'-DDD	2.4E-01	100%	2.4E-01	1/mg/kg/day	B2	IRIS	07/01/98
4,4'-DDE	3.4E-01	100%	3.4E-01	1/mg/kg/day	B2	IRIS	07/01/98
Aldrin	1.7E+01	100%	1.7E+01	1/mg/kg/day	B2	IRIS	07/01/98
Beta-BHC	1.8E+00	100%	1.8E+00	1/mg/kg/day	C	IRIS	07/01/98
Dieldrin	1.6E+01	100%	1.6E+01	1/mg/kg/day	B2	IRIS	07/01/98
Endosulfan Sulfate	-	-	-	-	-	IRIS	07/01/98
Endrin Aldehyde	-	-	-	-	B2	IRIS	07/01/98
Endrin Ketone	-	-	-	-	-	IRIS	07/01/98
Heptachlor Epoxide	9.1E+00	100%	9.1E+00	1/mg/kg/day	B2	IRIS	07/01/98
Aroclor 1242	2.0E+00	100%	2.0E+00	1/mg/kg/day	B2	IRIS	07/01/98
Aroclor 1248	2.0E+00	100%	2.0E+00	1/mg/kg/day	B2	IRIS	07/01/98
Aroclor 1254	2.0E+00	100%	2.0E+00	1/mg/kg/day	B2	IRIS	07/01/98
Aroclor 1260	2.0E+00	100%	2.0E+00	1/mg/kg/day	B2	IRIS	07/01/98
Barium	-	-	-	-	-	IRIS	07/01/98
Manganese	-	-	-	-	D	IRIS	07/01/98
Antimony	-	-	-	-	D	IRIS	07/01/98
Arsenic	1.5E+00	100%	1.5E+00	1/mg/kg/day	A	IRIS	07/01/98
Beryllium	-	-	-	-	-	IRIS	07/01/98
Cadmium	-	-	-	-	-	IRIS	07/01/98
Chromium	-	-	-	-	A(3)	IRIS	07/23/98
Copper	-	-	-	-	D	IRIS	07/01/98
Lead	-	-	-	-	B2	IRIS	07/01/98
Mercury	-	-	-	-	D	IRIS	07/01/98
Nickel	-	-	-	-	-	IRIS	07/01/98
Silver	-	-	-	-	D	IRIS	08/03/98
Thallium	-	-	-	-	D	IRIS	07/01/98
Vanadium	-	-	-	-	-	IRIS	07/01/98
Zinc	-	-	-	-	D	IRIS	07/01/98

(1) Dermal Slope Factor = Oral Slope Factor/GI Absorption (or the Oral/Dermal Adjustment Factor)
(2) Refers to the date IRIS was searched for the WOE/Cancer Guideline Description.
(3) Chromium VI, Inhalation Only

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TABLE 33
CANCER TOXICITY DATA – ORAL/DERMAL
Roebling Steel Company Superfund Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor	Adjusted Dermal Cancer Slope Factor (1)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (2) (MM/DD/YY)

EPA Group:
- A - Human carcinogen
- B1 - Probable human carcinogen - indicates that limited human data are available
- B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
- C - Possible human carcinogen
- D - Not classifiable as a human carcinogen
- E - Evidence of noncarcinogenicity

Weight of Evidence:
- Known/Likely
- Cannot be Determined
- Not Likely

Definitions:
IRIS = Integrated Risk Information System
WOE = Weight of Evidence
- = Not Applicable/Not Available

TABLE 34
CANCER TOXICITY DATA -- INHALATION
Roebling Steel Company Superfund Site

Chemical of Potential Concern	Unit Risk	Units	Adjustment (2)	Inhalation Cancer Slope Factor	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (1) (MM/DD/YY)
Pentachlorophenol	-	-		-	-	B2	IRIS	07/01/98
Hexachlorobenzene	4.6E-04	$1/ug/m^3$		1.6E+00	1/mg/kg/day	B2	IRIS	07/01/98
2,4-Dinitrotoluene	-	-		-	-	-	IRIS	07/01/98
Dibenzofuran	-	-		-	-	D	IRIS	07/01/98
Acenaphthylene	-	-		-	-	D	IRIS	07/01/98
Benzo(a)Pyrene	8.9E-04	$1/ug/m^3$		3.1E+00	1/mg/kg/day	B2	IRIS	07/01/98
Benzo(g,h,i)perylene	-	-		-	-	D	IRIS	07/01/98
Benzo(a)anthracene	-	-		-	-	B2	IRIS	07/01/98
Benzo(b)fluoranthene	-	-		-	-	B2	IRIS	07/01/98
Benzo(k)fluoranthene	-	-		-	-	B2	IRIS	07/01/98
Chrysene	-	-		-	-	B2	IRIS	07/01/98
Dibenz[a,h]anthracene	-	-		-	-	B2	IRIS	07/01/98
Indeno(1,2,3-cd)pyrene	-	-		-	-	B2	IRIS	07/01/98
Phenanthrene	-	-		-	-	D	IRIS	07/01/98
Aldrin	4.9E-03	$1/ug/m^3$		1.7E+01	1/mg/kg/day	B2	IRIS	07/01/98
Dieldrin	4.6E-03	$1/ug/m^3$		1.6E+01	1/mg/kg/day	B2	IRIS	07/01/98
Endosulfan Sulfate	-	-		-	-	-	IRIS	07/01/98
Endrin Aldehyde	-	-		-	-	-	IRIS	07/01/98
Endrin Ketone	-	-		-	-	-	IRIS	07/01/98
Heptachlor Epoxide	2.6E-03	$1/ug/m^3$		9.1E+00	1/mg/kg/day	B2	IRIS	07/01/98
Aroclor 1242(4)	5.7E-04	$1/ug/m^3$		2.0E+00	1/mg/kg/day	B2	IRIS	07/01/98
Aroclor 1248(4)	5.7E-04	$1/ug/m^3$		2.0E+00	1/mg/kg/day	-	IRIS	07/01/98
Aroclor 1254(4)	5.7E-04	$1/ug/m^3$		2.0E+00	1/mg/kg/day	B2	IRIS	07/01/98
Aroclor 1260(4)	5.7E-04	$1/ug/m^3$		2.0E+00	1/mg/kg/day	B2	IRIS	07/01/98
Barium	-	-		-	-	-	IRIS	07/01/98
Manganese	-	-		-	-	D	IRIS	07/01/98
Antimony	-	-		-	-	D	IRIS	07/01/98
Arsenic	4.3E-03	$1/ug/m^3$		1.5E+01	1/mg/kg/day	A	IRIS	07/01/98
Beryllium	2.4E-03	$1/ug/m^3$		8.4E+00	1/mg/kg/day	B1	IRIS	07/01/98
Cadmium	1.8E-03	$1/ug/m^3$		6.30(4)	1/mg/kg/day	B1	IRIS	07/01/98
Chromium(3)	1.2E-02	$1/ug/m^3$		4.1E+01	1/mg/kg/day	A	IRIS	07/23/98
Copper	6.3E-04	$1/ug/m^3$		2.2E+00	1/mg/kg/day	D	IRIS	07/01/98
Lead	-	-		-	-	B2	IRIS	07/01/98
Nickel	-	-		-	-	-	IRIS	07/01/98
Silver	-	-		-	-	D	IRIS	08/03/98
Thallium	-	-		-	-	D	IRIS	07/01/98
Vanadium	-	-		-	-	-	IRIS	07/23/98
Zinc	-	-		-	-	D	IRIS	07/01/98

(1) Refers to the date IRIS was searched for the Unit Risk value and WOE.
(2) Inhalation CSF = (Inh Unit Risk * 70 kg)/($20m^3$/day * 10^{-3} mg/ug)
(3) Inhalation CSF is for Chromium IV.
(4) Oral CSF used for particulates per IRIS.

Definitions:
- = Not Applicable/Not Available
IRIS = Integrated Risk Information System
NCEA = Superfund Health Risk Technical Support Center
Inh = Inhalation
WOE = Weight of Evidence

Sources: IRIS, 1998c

TABLE 34
CANCER TOXICITY DATA -- INHALATION
Roebling Steel Company Superfund Site

Chemical of Potential Concern	Unit Risk	Units	Adjustment (2)	Inhalation Cancer Slope Factor	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (1) (MM/DD/YY)

NCEA

84859021 1

TABLE 35.1.RME

RISK ASSESSMENT SUMMARY

REASONABLE MAXIMUM EXPOSURE

Roebling Steel Company Superfund Site

Scenario Timeframe: Current
Receptor Population: Child Trespasser
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Arsenic	2.95E-06	4.63E-09	3.55E-07	3.31E-06						
			(Total)	2.95E-06	4.63E-09	3.55E-07	3.31E-06	(Total)		-	-	-	-

Total Risk Across [Surface Soil] 3.31E-06

Total Risk Across All Media and All Exposure Routes 3.31E-06

Total Hazard Index Across All Media and All Exposure Routes -

Total [longevity] HI = -

Definitions:

- = Not Applicable/Not Available

N/A = Not applicable because the exposure pathway was not quantitatively analyzed.

Bolded Numbers = Although exposure pathway shows a carcinogenic risk >10^{-06} or a noncarcinogenic risk > 1, no individual chemical in the pathway shows a carcinogenic risk >10^{-06} or a noncarcinogenic risk > 1

84859021 2

TABLE 35.1.CT

RISK ASSESSMENT SUMMARY

CENTRAL TENDENCY

Roebling Steel Company Superfund Site

Scenario Timeframe: Current
Receptor Population: Child Trespasser
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Arsenic	7.39E-07	1.16E-09	3.56E-07	1.10E-06	-	-	-	-	-	-
			-	-	-	-	-						
			(Total)	-	-	-	1.10E-06	(Total)	-	-	-	-	-

Total Risk Across [Surface Soil]	1.10E-06
Total Risk Across All Media and All Exposure Routes	1.10E-06
Total Hazard Index Across All Media and All Exposure Routes	-

Definitions:

- = Not Applicable/Not Available

N/A = Not applicable because the exposure pathway was not quantitatively analyzed.

Bolded Numbers = Although exposure pathway shows a carcinogenic risk $>10^{-06}$ or a noncarcinogenic risk > 1, no individual chemical in the pathway shows a carcinogenic risk $>10^{-06}$ or a noncarcinogenic risk > 1

TABLE 35.2.RME

RISK ASSESSMENT SUMMARY

REASONABLE MAXIMUM EXPOSURE

Roebling Steel Company Superfund Site

Scenario Timeframe: Current
Receptor Population: Downwind Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Air Particulates	Downwind Air Particulates	Arsenic	N/A	1.20E-06	N/A	1.20E-06						
			(Total)	N/A	1.20E-06	N/A	1.20E-06	(Total)		N/A	-	N/A	-

Total Risk Across [Downwind Air Particulates] 1.20E-06

Total Risk Across All Media and All Exposure Routes 1.20E-06

Total Hazard Index Across All Media and All Exposure Routes -

Total [ ] HI = -

Definitions:

- = Not Applicable/Not Available

N/A = Not applicable because the exposure pathway was not quantitatively analyzed.

848590214

TABLE 36.2.CT

RISK ASSESSMENT SUMMARY

CENTRAL TENDENCY

Roebling Steel Company Superfund Site

Scenario Timeframe: Current
Receptor Population: Downwind Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Air Particulates	Downwind Air Particulates	-	N/A	-	N/A	-	-	-	N/A	-	N/A	-
			(Total)	N/A	-	N/A	-	(Total)		N/A	-	N/A	-
						Total Risk Across [Downwind Air Particulates]	-					Total Hazard Index Across All Media and All Exposure Routes	-
						Total Risk Across All Media and All Exposure Routes	-						

Definitions:

- = Not Applicable/Not Available

N/A = Not applicable because the exposure pathway was not quantitatively analyzed.

848590215

TABLE 35.3.RME

RISK ASSESSMENT SUMMARY

REASONABLE MAXIMUM EXPOSURE

Roebling Steel Company Superfund Site

Scenario Timeframe: Current
Receptor Population: Downwind Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Air Particulates	Surface Soil Air Particulates	Air Particulates	Arsenic	N/A	1.12E-06	N/A	1.12E-06	Manganese	CNS	N/A	1.57	N/A	1.57
			(Total)	N/A	1.12E-06	N/A	1.12E-06	(Total)		N/A	-	N/A	-

Total Risk Across [Downwind Air Particulates] 1.12E-06

Total Risk Across All Media and All Exposure Routes 1.12E-06

Total Hazard Index Across All Media and All Exposure Routes 1.57

Total [CNS] HI = 1.57

Definitions:

- = Not Applicable/Not Available

N/A = Not applicable because the exposure pathway was not quantitatively analyzed.

848590216

TABLE 35.3.CT

RISK ASSESSMENT SUMMARY

CENTRAL TENDENCY

Roebling Steel Company Superfund Site

Scenario Timeframe: Current
Receptor Population: Downwind Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Air Particulates	Surface Soil Air Particulates	Air Particulates	-	N/A	-	N/A	-	-	-	N/A	-	N/A	-
			(Total)	N/A	-	N/A	-	(Total)	-	N/A	-	N/A	-

Total Risk Across [Downwind Air Particulates]: -

Total Risk Across All Media and All Exposure Routes: -

Total Hazard Index Across All Media and All Exposure Routes: -

Definitions:

- = Not Applicable/Not Available

N/A = Not applicable because the exposure pathway was not quantitatively analyzed.

84859021 7

TABLE 35.4.RME
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Hexachlorobenzene	5.26E-07	N/A	9.00E-07	1.43E-06	Antimony	longevity, blood glucose, cholesterol	1.24	N/A	-	1.24
			Benzo(a)Pyrene	5.04E-06	N/A	1.12E-05	1.62E-05						
			Benzo(a)anthracene	5.58E-07	N/A	1.24E-06	1.80E-06	-	-	-	-	-	-
			Benzo(b)fluoranthene	7.05E-07	N/A	1.57E-06	2.28E-06	-	-	-	-	-	-
			Dibenz[a,h]anthracene	3.15E-06	N/A	6.99E-06	1.01E-05	-	-	-	-	-	-
			Ideno(1,2,3-cd)pyrene	3.90E-07	N/A	8.66E-07	1.26E-06	-	-	-	-	-	-
			Dieldrin	4.74E-07	N/A	8.10E-07	1.28E-06	-	-	-	-	-	-
			Aroclor 1248	2.97E-07	N/A	7.11E-07	1.01E-06	-	-	-	-	-	-
			Aroclor 1254	4.50E-07	N/A	1.08E-06	1.53E-06	-	-	-	-	-	-
			Aroclor 1260	5.19E-07	N/A	1.24E-06	1.76E-06	-	-	-	-	-	-
			Arsenic	1.76E-05	N/A	9.04E-06	2.67E-05	-	-	-	-	-	-
			(Total)	2.92E-05	N/A	3.47E-05	6.39E-05	(Total)		1.24	N/A	-	1.24
Subsurface Soil	Subsurface Soil	Subsurface Soil	Arsenic	1.39E-06	N/A	7.14E-07	2.10E-06	-	-	-	N/A	-	-
			(Total)	1.39E-06	N/A	7.14E-07	2.10E-06	(Total)		-	N/A	-	-
Groundwater	Groundwater	Groundwater	Trichloroethene	4.04E-07	3.50E-05	5.84E-08	3.55E-05						
			Arsenic	2.02E-04	N/A	4.60E-07	2.02E-04	Arsenic	skin	1.050	N/A	0.002380	1.05
			(Total)	2.02E-04	3.50E-05	5.18E-07	2.38E-04	(Total)		1.05	N/A	0.00238	1.052

Total Risk Across [Surface Soil]	6.39E-05
Total Risk Across [Subsurface Soil]	2.10E-06
Total Risk Across [Groundwater]	2.38E-04
Total Risk Across All Media and All Exposure Routes	2.69E-04

Total Hazard Index Across All Media and All Exposure Routes	2.29
Total [longevity, blood glucose, cholesterol] HI =	1.24
Total [skin] HI =	1.05

Definitions:
- = Not Applicable/Not Available
N/A = Not applicable because the exposure pathway was not quantitatively analyzed.

TABLE 35.4.CT
RISK ASSESSMENT SUMMARY
CENTRAL TENDENCY
Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Benzo(a)pyrene	7.56E-07	N/A	7.84E-07	1.54E-06	Antimony	longevity	0.618	N/A	-	0.618
			Arsenic	2.64E-06	N/A	6.32E-07	3.27E-06	-	-	-	N/A	-	-
			(Total)	3.40E-06	N/A	1.42E-06	4.81E-06	(Total)		-	N/A	-	-
Subsurface Soil	Subsurface Soil	Subsurface Soil	-	-	N/A	-	-	Thallium	liver	0.528	N/A	-	0.526
			(Total)	-	N/A	-	-	(Total)		-	N/A	-	-
Groundwater	Groundwater	Groundwater	Trichloroethene	8.14E-08	1.00E-05	1.38E-08	1.01E-05						
			Arsenic	4.07E-05	N/A	8.99E-08	4.08E-05	Arsenic	skin	0.703	N/A	0.001	0.0705
			(Total)	4.08E-05	1.00E-05	1.04E-07	5.09E-05						

Total Risk Across [Surface Soil]	4.81E-06
Total Risk Across [Subsurface Soil]	-
Total Risk Across [Groundwater]	5.09E-05
Total Risk Across All Media and All Exposure Routes	5.57E-05

Total Hazard Index Across All Media and All Exposure Routes	1.85

Definitions:
- = Not Applicable/Not Available
N/A = Not applicable because the exposure pathway was not quantitatively analyzed.

TABLE 35.5.RME

RISK ASSESSMENT SUMMARY

REASONABLE MAXIMUM EXPOSURE

Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Hexachlorobenzene	9.82E-07	N/A	2.85E-07	1.27E-06	Antimony	longevity, blood glucose, cholesterol	11.5	N/A	-	11.5
			Benzo(a)pyrene	9.41E-06	N/A	3.55E-06	1.30E-05	Manganese	CNS	1.03	N/A	-	1.03
			Benzo(a)anthracene	1.04E-06	N/A	3.93E-07	1.43E-06	Arsenic	skin	0.85	N/A	0.07	0.93
			Benzo(b)fluoranthene	1.32E-06	N/A	4.96E-07	1.82E-06	-	-	-	-	-	-
			Dibenzo(a,h)anthracene	5.87E-06	N/A	2.21E-06	8.08E-06	-	-	-	-	-	-
			Indeno(1,2,3-cd)pyrene	7.27E-07	N/A	2.74E-07	1.00E-06	-	-	-	-	-	-
			Dieldrin	8.84E-07	N/A	2.56E-07	1.14E-06	-	-	-	-	-	-
			Aroclor 1254	8.39E-07	N/A	3.41E-07	1.18E-06	-	-	-	-	-	-
			Aroclor 1260	9.69E-07	N/A	3.93E-07	1.36E-06	-	-	-	-	-	-
			Arsenic	3.29E-05	N/A	2.86E-06	3.58E-05						
			(Total)	5.49E-05	N/A	1.11E-05	6.60E-05	(Total)		13.4	N/A	0.07	13.5
Subsurface Soil	Subsurface Soil	Subsurface Soil	Benzo(a)pyrene	1.92E-06	N/A	7.25E-07	2.65E-06	Manganese	CNS	0.710	N/A	-	0.71
			Dibenzo(a,h)anthracene	1.63E-06	N/A	6.13E-07	2.24E-06	Arsenic	skin	1.01	N/A	0.088	1.10
			Arsenic	1.30E-05	N/A	1.13E-06	1.41E-05						
			(Total)	1.66E-05	N/A	2.47E-06	1.90E-05	(Total)		1.72	N/A	0.09	1.81
Groundwater	Groundwater	Groundwater	Trichloroethene	1.89E-07	3.50E-05	2.67E-07	3.55E-05	Manganese	CNS	0.99	-	0.092	1.09
			Arsenic	9.43E-05	N/A	2.10E-06	9.64E-05	Arsenic	skin	2.44	N/A	0.005	2.44
			(Total)	9.45E-05	3.50E-05	2.37E-06	1.32E-04	Lead	-	-	N/A	-	-
								(Total)		2.44	N/A	0.005	3.53

Total Risk Across [Surface Soil]	6.6E-05
Total Risk Across [Subsurface Soil]	1.90E-05
Total Risk Across [Groundwater]	1.32E-04
Total Risk Across All Media and All Exposure Routes	2.17E-04

Total Hazard Index Across All Media and All Exposure Routes	18.8
Total [longevity] HI =	11.5
Total [CNS] HI =	2.83
Total [skin] HI =	4.47

N/A = Not applicable because the exposure pathway was not quantitatively analyzed.

Bolded Numbers = Although exposure pathway shows a carcinogenic risk $>10^{-06}$ or a noncarcinogenic risk > 1, no individual chemical in the pathway shows a carcinogenic risk $>10^{-06}$ or a noncarcinogenic risk > 1

848590220

TABLE 35.5.CT

RISK ASSESSMENT SUMMARY

CENTRAL TENDENCY

Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Benzo(a)pyrene	2.35E-06	N/A	3.55E-06	5.90E-06	Antimony	longevity, blood glucose, cholesterol	2.88	N/A	-	2.88
			Dibenz[a,h]anthracene	1.47E-06	N/A	2.21E-06	3.68E-06	-	-	-	-	-	-
			Arsenic	8.22E-06	N/A	2.86E-06	1.11E-05	-	-	-	-	-	-
			(Total)	1.20E-05	N/A	8.62E-06	2.07E-05	(Total)		2.88	N/A	-	2.88
Subsurface Soil	Subsurface Soil	Subsurface Soil	Arsenic	1.62E-06	N/A	5.65E-07	2.19E-06	-	-	-	-	-	-
			(Total)	1.62E-06	N/A	5.65E-07	2.19E-06	(Total)		-	N/A	-	-
Groundwater	Groundwater	Groundwater	Trichloroethene	1.89E-07	1.00E-05	1.83E-07	1.04E-05						
			Arsenic	9.43E-05	N/A	1.19E-06	9.55E-05	Arsenic	skin	1.41	N/A	0.002646	1.41
			(Total)	9.61E-05	1.00E 05	1.94E-06	1.06E-04	(Total)		1.41	N/A	0.0026	1.41

Total Risk Across [Surface Soil]	2.07E-05
Total Risk Across [Subsurface Soil]	2.19E-06
Total Risk Across [Groundwater]	1.06E-04
Total Risk Across All Media and All Exposure Routes	1.29E-04

Total Hazard Index Across All Media and All Exposure Routes	4.29
Total [CNS] HI =	1.41
Total [longevity] HI =	2.88
Total [skin] HI =	1.41
Total [gastro-intestine] HI =	-

Definitions:

- = Not Applicable/Not Available

N/A = Not applicable because the exposure pathway was not quantitatively analyzed.

848590221

TABLE 35.6.RME

RISK ASSESSMENT SUMMARY

REASONABLE MAXIMUM EXPOSURE

Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Receptor Population: Site Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Benzo(a)pyrene	3.00E-06	N/A	2.93E-06	5.93E-06		-	-	-	-	-
			Dibenz[a,h]anthracene	1.87E-06	N/A	1.83E-06	3.70E-06						
			Arsenic	1.05E-05	N/A	2.36E-06	1.28E-05						
			(Total)	1.54E-05	N/A	7.12E-06	2.25E-05	(Total)		-	-	-	-
Subsurface Soil	Subsurface Soil	Subsurface Soil	Arsenic	9.94E-07	N/A	2.24E-07	1.22E-06	-	-	-	N/A	-	-
			(Total)	9.94E-07	N/A	2.24E-07	1.22E-06	(Total)		-	N/A	-	-
Groundwater	Groundwater	Groundwater	Arsenic	5.77E-05	N/A	N/A	5.77E-05	-	-	-	-	-	-
			(Total)	5.77E-05	N/A	N/A	5.77E-05	(Total)		-	-	-	-

Total Risk Across [Surface Soil]	2.25E-05
Total Risk Across [Subsurface Soil]	1.22E-06
Total Risk Across [Groundwater]	5.77E-05
Total Risk Across All Media and All Exposure Routes	8.14E-05

Total Hazard Index Across All Media and All Exposure Routes	-
Total [longevity, blood glucose, cholesterol] HI =	-

Definitions:

- = Not Applicable/Not Available

N/A = Not applicable because the exposure pathway was not quantitatively analyzed.

Bolded Numbers = Although exposure pathway shows a carcinogenic risk $>10^{-4}$ or a noncarcinogenic risk > 1, no individual chemical in the pathway shows a carcinogenic risk $>10^{-4}$ or a noncarcinogenic risk > 1

848590222

TABLE 35.6.CT
RISK ASSESSMENT SUMMARY
CENTRAL TENDENCY
Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Receptor Population: Site Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Arsenic	1.33E-05	N/A	1.54E-07	1.34E-05	-	-	-	N/A	-	-
			(Total)	1.33E-05	N/A	1.54E-07	1.34E-05	(Total)		-	N/A	-	-
Subsurface Soil	Subsurface Soil	Subsurface Soil	-	-	-	-	-	-	-	-	N/A	-	-
			(Total)	-	-	-	-	(Total)		-	N/A	-	-
Groundwater	Groundwater	Groundwater	Arsenic	1.62E-05	N/A	N/A	1.62E-05	-	-	-	N/A	N/A	-
			(Total)	1.62E-05	N/A	N/A	1.62E-05	(Total)		-	N/A	N/A	-

Total Risk Across [Surface Soil]	1.34E-05
Total Risk Across [Subsurface Soil]	-
Total Risk Across [Groundwater]	1.62E-05
Total Risk Across All Media and All Exposure Routes	2.96E-05

Total Hazard Index Across All Media and All Exposure Routes	-

Definitions:

- = Not Applicable/Not Available

N/A = Not applicable because the exposure pathway was not quantitatively analyzed.

84859023

TABLE 35.7.RME

RISK ASSESSMENT SUMMARY

REASONABLE MAXIMUM EXPOSURE

Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Arsenic	1.68E-06	2.92E-09	1.89E-07	1.87E-06	Antimony	longevity, blood glucose, cholesterol	1.77	-		1.77
			-	-	-	-	-						
			(Total)	1.68E-06	2.92E-09	1.89E-07	1.87E-06	(Total)		1.77	0.00	0.00	1.77
Subsurface Soil	Subsurface Soil	Subsurface Soil	Arsenic	1.99E-06	3.46E-09	2.24E-07	2.22E-06	-	-	-	-	-	-
			(Total)	1.99E-06	3.46E-09	2.24E-07	2.22E-06	(Total)		-	-	-	-

Total Risk Across [Surface Soil]	1.87E-06
Total Risk Across [Subsurface Soil]	2.22E-06
Total Risk Across All Media and All Exposure Routes	4.09E-06

Total Hazard Index Across All Media and All Exposure Routes	1.77
Total [longevity] HI =	1.77
Total [ ] HI =	-

Definitions:

- = Not Applicable/Not Available

N/A = Not applicable because the exposure pathway was not quantitatively analyzed.

Bolded Numbers = Although exposure pathway shows a carcinogenic risk $>10^{-06}$ or a noncarcinogenic risk > 1, no individual chemical in the pathway shows a carcinogenic risk $>10^{-06}$ or a noncarcinogenic risk > 1

TABLE 35.7.CT

RISK ASSESSMENT SUMMARY

CENTRAL TENDENCY

Roebling Steel Company Superfund Site

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	-	-	-	-	-	-	-	-	-	-	-
			(Total)	-	-	-	-	(Total)		-	-	-	-
Subsurface Soil	Subsurface Soil	Subsurface Soil	-	-	-	-	-	-	-	-	-	-	-
			(Total)	-	-	-	-	(Total)		-	-	-	-

Total Risk Across [Surface Soil]	-
Total Risk Across [Subsurface Soil]	-
Total Risk Across All Media and All Exposure Routes	-
Total Hazard Index Across All Media and All Exposure Routes	-

Definitions:

- = Not Applicable/Not Available

N/A = Not applicable because the exposure pathway was not quantitatively analyzed.

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TABLE 35.8.RME

RISK ASSESSMENT SUMMARY

REASONABLE MAXIMUM EXPOSURE

Roebling Steel Company Superfund Site

Scenario Timeframe: Current and Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Delaware River Sediment	Sediment	Sediment	Benzo(a)pyrene	6.42E-07	N/A	3.73E-07	1.02E-06	-	-	-	N/A	-	-
			(Total)	-	N/A	-	1.02E-06	(Total)		-	N/A	-	-
Crafts Creek Sediment	Sediment	Sediment	Benzo(a)pyrene	9.39E-07	N/A	5.45E-07	1.48E-06	-	-	-	N/A	-	-
			(Total)	9.39E-07	N/A	5.45E-07	1.48E-06	(Total)		-	N/A	-	-
Delaware River Surface Water	Surface Water	Tap Water	Lead	-	N/A	-	-	-	-	-	N/A	-	-
			(Total)	-	N/A	-	-	(Total)		-	N/A	-	-
Delaware River Surface Water	Air	Water Vapors at Showerhead	No VOCs										
			(Total)					(Total)					
Crafts Creek Surface Water	Surface Water	Surface Water	-	-	N/A	-	-	-		-	N/A	-	-
			(Total)	-	N/A	-	-	(Total)		-	N/A	-	-
Consumable Fish	Animal Tissue	Fish from Crafts Creek	4,4'-DDD	1.98E-06	N/A	N/A	1.98E-06	Copper	gastro-intestine	1.30	N/A	N/A	1.30
			4,4'-DDE	8.42E-06	N/A	N/A	8.42E-06	Mercury	paresthesia	2.2	N/A	N/A	2.2
			(Total)	1.04E-05	N/A	N/A	1.04E-05	(Total)		3.5	N/A	N/A	3.5

Total Risk Across[Delaware River Sediment]	1.02E-06
Total Risk Across[Crafts Creek Sediment]	1.48E-06
Total Risk Across[Delaware River Surface Water:Surface Water]	-
Total Risk Across[Delaware River Surface Water:Air]	-
Total Risk Across[Crafts Creek Surface Water:Surface Water]	-
Total Risk Across[Consumable Fish]	1.04E-05
Total Risk Across All Media and All Exposure Routes	1.29E-05

Total Hazard Index Across All Media and All Exposure Routes	3.5
Total [gastro-intestine] HI =	1.30
Total [paresthesia] HI =	2.2

Definitions:

- = Not Applicable/Not Available

N/A = Not applicable because the exposure pathway was not quantitatively analyzed.

TABLE 35.8.CT
RISK ASSESSMENT SUMMARY
CENTRAL TENDENCY
Roebling Steel Company Superfund Site

Scenario Timeframe: Current and Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Delaware River Sediment	Sediment	Sediment	-	-	N/A	-	-	-	-	-	-	-	-
			(Total)	-	N/A	-	-	(Total)		-	-	-	-
Crafts Creek Sediment	Sediment	Sediment	-	-	N/A	-	-	-	-	-	-	-	-
			(Total)	-	N/A	-	-	(Total)					
Delaware River Surface Water	Surface Water	Tap Water	Lead	-	N/A	-	-	-	-	-	N/A	-	-
			(Total)	-	N/A	-	-	(Total)		-	N/A	-	-
Delaware River Surface Water	Air	Water Vapors at Showerhead	No VOCs										
			(Total)					(Total)					
Crafts Creek Surface Water	Surface Water	Surface Water	-	-	N/A	-	-	-	-	-	N/A	-	-
			(Total)	-	N/A	-	-	(Total)		-	N/A	-	-
Consumable Fish	Animal Tissue	Fish from Crafts Creek		-	N/A	N/A	-			-	N/A	N/A	-
			(Total)	-	N/A	N/A	-	(Total)		-	N/A	N/A	-

Total Risk Across[Delaware River Sediment]	-
Total Risk Across[Crafts Creek Sediment]	-
Total Risk Across[Delaware River Surface Water:Surface Water]	-
Total Risk Across[Delaware River Surface Water:Air]	-
Total Risk Across[Crafts Creek Surface Water:Surface Water]	-
Total Risk Across[Consumable Fish]	-
Total Risk Across All Media and All Exposure Routes	-

Total Hazard Index Across All Media and All Exposure Routes	-

Definitions:
- = Not Applicable/Not Available
N/A = Not applicable because the exposure pathway was not quantitatively analyzed.

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TABLE 35.9.RME
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
Roebling Steel Company Superfund Site

Scenario Timeframe: Current and Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Delaware River Sediment	Sediment	Sediment	Dibenzo(a,h)anthracene	1.41E-06	N/A	9.73E-07	2.39E-06	-	-	-	N/A	-	-
			Benzo(a)pyrene	5.99E-07	N/A	2.13E-06	2.73E-06	-	-	-	N/A	-	-
			(Total)	2.01E-06	N/A	3.10E-06	5.12E-06	(Total)		-	N/A	-	-
Crafts Creek Sediment	Sediment	Sediment	Benzo(a)anthracene	1.50E-07	N/A	2.17E-06	2.32E-06	-	-	-	N/A	-	-
			Benzo(a)pyrene	8.76E-07	N/A	1.27E-05	1.36E-05				N/A		
			Benzo(b)fluoranthene	2.26E-07	N/A	3.27E-06	3.50E-06				N/A		
			(Total)	1.25E-06	N/A	1.81E-05	1.84E-05	(Total)		-	N/A	-	-
Delaware River Surface Water	Surface Water	Tap Water	Lead	-	N/A	-	-	-	-	-	-	-	-
			(Total)	-	N/A	-	-	(Total)		-	-	-	-
	Air	Water Vapors at Showerhead	No VOCs	-	-	-	-	-	-	-	-	-	-
			(Total)	-	-	-	-	(Total)		-	-	-	-
Crafts Creek Surface Water	Surface Water	Surface Water	-	-	-	-	-	-	-	-	-	-	-
			(Total)	-	-	-	-	(Total)		-	-	-	-
Consumable Fish	Animal Tissue	Fish from Crafts Creek		-	N/A	N/A	-	Mercury	Neurodevelopment	1.16	N/A	N/A	1.16
			(Total)	-	N/A	N/A	-	(Total)		1.16	N/A	N/A	1.16

Total Risk Across[Delaware River Sediment]	5.12E-06
Total Risk Across[Crafts Creek Sediment]	1.94E-05
Total Risk Across[Delaware River Surface Water:Surface Water]	-
Total Risk Across[Delaware River Surface Water:Air]	-
Total Risk Across[Crafts Creek Surface Water:Surface Water]	-
Total Risk Across[Consumable Fish]	-
Total Risk Across All Media and All Exposure Routes	2.45E-05

Total Hazard Index Across All Media and All Exposure Routes	1.16

Definitions:
- = Not Applicable/Not Available
N/A = Not applicable because the exposure pathway was not quantitatively analyzed.

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TABLE 35.9.CT
RISK ASSESSMENT SUMMARY
CENTRAL TENDENCY
Roebling Steel Company Superfund Site

Scenario Timeframe: Current and Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Delaware River Sediment	Sediment	Sediment	-	-	N/A	-	-	-	-	-	N/A	-	-
			(Total)	-	N/A	-	-	(Total)		-	N/A	-	-
Crafts Creek Sediment	Sediment	Sediment	-	-	N/A	-	-	-	-	-	N/A	-	-
			(Total)	-	N/A	-	-	(Total)		-	N/A	-	-
Delaware River Surface Water	Surface Water	Tap Water	Lead	-	-	-	-	-	-	-	-	-	-
			(Total)	-	-	-	-	(Total)		-	-	-	-
Delaware River Surface Water	Air	Water Vapors at Showerhead	No VOCs	-	-	-	-	-	-	-	-	-	-
			(Total)	-	-	-	-	(Total)		-	-	-	-
Crafts Creek Surface Water	Surface Water	Surface Water	-	-	-	-	-	-	-	-	-	-	-
			(Total)	-	-	-	-	(Total)		-	-	-	-
Consumable Fish	Animal Tissue	Fish from Crafts Creek	-	-	N/A	N/A	-	Mercury	Neurodevelopment	1.16	N/A	N/A	1.16
			(Total)	-	N/A	N/A	-	(Total)		1.16	N/A	N/A	1.16

Total Risk Across[Delaware River Sediment]	-
Total Risk Across[Crafts Creek Sediment]	-
Total Risk Across[Delaware River Surface Water:Surface Water]	-
Total Risk Across[Delaware River Surface Water:Air]	-
Total Risk Across[Crafts Creek Surface Water:Surface Water]	-
Total Risk Across[Consumable Fish]	-
Total Risk Across All Media and All Exposure Routes	-

Total Hazard Index Across All Media and All Exposure Routes	1.16

Definitions:
- = Not Applicable/Not Available
N/A = Not applicable because the exposure pathway was not quantitatively analyzed.

Table 35.10

COC Concentrations Expected to Provide Adequate Protection of Ecological Receptors

Habitat Type/ Name	Exposure Medium	COC	Target Cleanup Level	Units	Basis	Assessment Endpoint
Delaware River and Crafts Creek	Sediment	Total PAHs	4	mg/kg	Lowest Effects Level	Benthic invertebrate community species diversity and abundance
		Arsenic	6	mg/kg	Lowest Effects Level	
		Copper	16	mg/kg	Lowest Effects Level	
		Chromium	26	mg/kg	Lowest Effects Level	
		Iron	20,000	mg/kg	Lowest Effects Level	
		Lead	31	mg/kg	Lowest Effects Level	
		Manganese	460	mg/kg	Lowest Effects Level	
Delaware River and Crafts Creek	Sediment	Lead	31	mg/kg	Lowest Effects Level	Maintenance of an abundant and productive fish population
Delaware River and Crafts Creek	Sediment	Lead	233	mg/kg	Site Specific NOAEL	Protection of avian fauna exposed to contaminants in impacted media

Notes

*Lowest Effects Levels obtained from the Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario, Canada (Persaud et al., 1993)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
AND REQUIREMENTS TO BE CONSIDERED (TBCs)

ARAR/TBC TYPE	REQUIREMENT	CITATION	DESCRIPTION	COMMENTS
CHEMICAL				
	FEDERAL			
	Safe Drinking Water Act Regulations	40 CFR 141	Drinking water standards, expressed as Maximum Contaminant Levels (MCLs), which apply to specific contaminants and which have been determined to have an adverse impact on human health.	ARAR which will serve as groundwater and/or surface water monitoring standards.
	Ambient Water Quality Criteria	Guidance Criteria	Guidelines established for the protection of human health and/or aquatic organisms.	ARAR which will serve as groundwater and/or surface water monitoring standards.
	Aquatic Sediment Quality Guidelines (Ontario)	Guidance Criteria	Guidelines for screening contaminants in freshwater sediments.	TBC for contaminated sediments in the Delaware River and Crafts Creek.
	Draft Soil Screening Guidance	Guidance Criteria	Establishes soil screening levels (SSLs) for specific contaminants and exposure pathways.	TBC for contaminants in OU-5 soils.
	Sediment Quality Screening	Guidelines for Deriving Site-specific Sediment Quality Criteria for the Protection of Benthic Organisms, 9/93 (EPA 822-R-93-017)	Guidance document prepared by USEPA for developing sediment quality criteria for organic elements that are reflective of local conditions.	TBC for contaminated sediments in the Delaware River and Crafts Creek.

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
AND REQUIREMENTS TO BE CONSIDERED (TBCs)

ARAR/TBC TYPE	REQUIREMENT	CITATION	DESCRIPTION	COMMENTS
CHEMICAL				
	STATE			
	Surface Water Quality Standards	NJAC 7:9B	Water quality standards for various classes of surface waters.	ARAR for surface water monitoring and/or effluent limitations on discharges to surface waters.
	Groundwater Quality Standards	NJAC 7:9-6	Groundwater quality standards for various classes of groundwater.	ARAR which will serve as groundwater and/or surface water monitoring standards.
	Safe Drinking Water Act Standards	NJAC 7:10-5.2	Contains the state's discretionary changes to the federal drinking water standards.	ARAR which will serve as groundwater and/or surface water monitoring standards.
	Industrial Site Recovery Act	NJSA 13:1K	Requires that soil remediation standards for human carcinogens for all NJ cleanups be calculated at a risk factor of one additional cancer risk in one million.	TBC for setting soil remediation criteria.
	Soil Cleanup Criteria	New Jersey Soil Cleanup Criteria (5/99)	Sets restricted (residential) and un-restricted (non-residential) soil cleanup standards and impact to groundwater criteria.	TBC for contaminants in on-site soils. Capping will serve to isolate soils in excess of applicable criteria.
	Sediment Quality Evaluations	NJDEP Guidance for Sediment Quality Evaluations (11/98)	Guidance for the evaluation of sediment quality to be used in the ecological risk assessment process.	TBC for evaluating sediment quality standards.

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TABLE 36 (Sheet 3 of 9)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
AND REQUIREMENTS TO BE CONSIDERED (TBCs)

ARAR/TBC TYPE	REQUIREMENT	CITATION	DESCRIPTION	COMMENTS
LOCATION				
	FEDERAL			
	Protection of Wetlands	Executive Order 11990	Requires consideration of impacts to wetlands in order to minimize their destruction, loss or degradation and to preserve/enhance wetland values.	ARAR for activities which would impact wetlands. Applicable to sediment excavation and capping activities in freshwater wetlands.
	Protection of Floodplains	Executive Order 11988	Requires consideration of impacts to floodplain areas in order to reduce flood loss risks, minimize flood impacts on human health, safety and welfare and preserve/restore floodplain values.	ARAR for sediment excavation on capping activities occurring within the 100-year, and 500-year floodplain. Will impact soil capping in slag and wharf areas.
	Endangered Species Act	16 USC 1531	Establishes requirements for the protection of federally listed threatened and endangered species and their habitat.	ARAR for activities which could affect threatened or endangered species or their habitat.
	National Historic Preservation Act	16 USC 470	Establishes requirements for the identification and preservation of historic and cultural resources.	ARAR for disturbance activities which could impact historic and cultural resources.
	Archeological Resources Protection Act	16 USC 470aa	Provides for the protection of archeological resources located on public lands.	ARAR for management of any archeological resources discovered during remediation activities.

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TABLE 36 (Sheet 4 of 9)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
AND REQUIREMENTS TO BE CONSIDERED (TBCs)

ARAR/TBC TYPE	REQUIREMENT	CITATION	DESCRIPTION	COMMENTS
LOCATION				
	(Continued)			
	Fish and Wildlife Coordination Act	16 USC 661	Requires consideration of impacts to wildlife resources resulting from the modification of waterways.	ARAR for on-site activities which would result in the diversion or other modification of rivers/ streams.
	Clean Water Act, Section 404(b)(1) Guidelines	40 CFR 230.10	Establishes criteria for evaluating impacts to waters of the US (including wetlands) and sets forth factors for considering mitigation measures.	ARAR for placement of fill or dredge material into on-site wetlands. Applicable to wetlands sediment excavation and restoration activities in Crafts Creek and the Delaware River.
	Rivers and Harbors Act, Section 10 regulations	33 CFR 320-330	Requirements for evaluating the placement of structures and/or excavation activities within navigable waters.	ARAR for remedial actions involving the management of contaminated sediments. Applicable to wetlands sediment excavation and restoration activities in Crafts Creek and the Delaware River.
	Resource Conservation and Recovery Act Location Standards	40 CFR 264.18	Regulates the design, construction, operation and maintenance of hazardous waste management facilities including various citing criteria.	ARAR for on-site treatment, storage or disposal of hazardous waste.

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TABLE 36 (Sheet 5 of 9)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
AND REQUIREMENTS TO BE CONSIDERED (TBCs)

ARAR/TBC TYPE	REQUIREMENT	CITATION	DESCRIPTION	COMMENTS
LOCATION				
	(Continued)			
	Wetlands Protection at Superfund sites	OSWER 9280.0-03	Guidance document to be used to evaluate inpacts to wetlands at Superfund sites.	TBC for impacts to freshwater and tidal wetlands, including Crafts Creek and the back channel of Delaware River.
	STATE			
	Flood Hazard Area Regulations	NJAC 7:13	Regulates the placement of fill, grading, excavation and other disturbances within the defined flood hazard area/floodplain of rivers/streams.	ARAR for site activities occurring within the flood hazard area or floodplain of on-site rivers/streams.
	Wetlands Act of 1970 Regulations	NJAC 7:7-2.2	Regulates the disturbance or alteration of mapped tidal wetlands and their respective buffers.	ARAR for sediment excavation and capping activities disturbing tidal wetlands and buffer areas.
	Waterfront Development Regulations	NJAC 7:7-2.3	Regulates development activities (including dredging/excavation) below the mean high water line of coastal waterways and extending up to 500 feet landward.	ARAR for site activities resulting in the placement of structures, soil excavation and/or dredging/fill placement within the Waterfront Development zone.

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TABLE 36 (Sheet 6 of 9)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
AND REQUIREMENTS TO BE CONSIDERED (TBCs)

ARAR/TBC TYPE	REQUIREMENT	CITATION	DESCRIPTION	COMMENTS
LOCATION				
	(Continued)			
	Coastal Resource Development Policies	NJAC 7:7E	Specifies the state's coastal resources policies for all regulated activities within the coastal zone; a Federal Consistency Review of potential remedial alternatives will be assessed by NJDEP.	ARAR for sediment excavation, capping, and restoration occurring within the mapped tidal wetlands, wetlands buffer zones and 500' Waterfront Development zone.
	Delaware River Basin Compact	NJSA 58:18	Requirements for activities impacting water resources within the Delaware River Basin.	ARAR for monitoring activities involving the withdrawal and discharge of groundwater.
	Riparian Lands Management	NJSA 12:3	Provides a mechanism for the issuance of grants/leases for activities within mapped currently and previously flowed riparian lands ("tidelands").	ARAR for site excavation and capping activities which occur within mapped riparian lands associated with tidal waterways.
	Freshwater Wetlands Protection Act Rules	NJAC 7:7A	Regulates the disturbance or alteration of freshwater wetlands and their respective buffers and provides for mitigation requirements.	ARAR for capping activities disturbing freshwater wetlands and buffer areas.

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TABLE 36 (Sheet 7 of 9)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
AND REQUIREMENTS TO BE CONSIDERED (TBCs)

ARAR/TBC TYPE	REQUIREMENT	CITATION	DESCRIPTION	COMMENTS
ACTION				
	FEDERAL			
	Hazardous Waste Generation	40 CFR 262	Specifies requirements for hazardous waste packaging, labeling, manifesting and storage.	ARAR for on-site management of hazardous waste.
	Treatment, Storage and Disposal of Hazardous Waste	40 CFR 264/265	Specifies requirements for the operation of hazardous waste treatment, storage and disposal facilities.	ARAR for on-site hazardous waste treatment, storage and disposal activities.
	Land Disposal Restrictions	40 CFR 268	Sets out prohibitions and establishes standards for the land disposal of hazardous wastes.	ARAR for on-site hazardous waste disposal activities.
	National Ambient Air Quality Standards-Particulates	40 CFR 50	Establishes maximum concentrations for particulates and fugitive dust emissions.	ARAR for on-site excavation and earth moving activities which would generate particulate emissions.
	National Emission Standards for Hazardous Air Pollutants (NESHAPs)	40 CFR 61	Establishes limitations for the emission of defined hazardous air pollutants.	ARAR for remedial activities which would generate hazardous air pollutants.
	Clean Water Act Effluent Guidelines and Standards	40 CFR 401	Provides requirements for point source discharges of pollutants.	ARAR for point source discharges of sediment dewatering effluent to surface waters.
	Clean Water Act Stormwater Program	40 CFR 122	Regulates the discharge of stormwater from industrial activities.	ARAR for point source discharges of stormwater to surface waters.

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
AND REQUIREMENTS TO BE CONSIDERED (TBCs)

ARAR/TBC TYPE	REQUIREMENT	CITATION	DESCRIPTION	COMMENTS
ACTION				
	(Continued)			
	USDOT Hazardous Materials Transportation Regulations	49 CFR 171-180	Establishes classification, packaging and labeling requirements for shipments of hazardous materials.	ARAR for the preparation of hazardous materials generated on-site for off-site shipment.
	USEPA Test Methods for Evaluation of Solid Waste	SW-846	Establishes analytical requirements for testing and evaluating solid/hazardous wastes.	TBC for testing waste samples.
	STATE			
	Hazardous Waste Management Regulations	NJAC 7:26G	Provides requirements for the generation, accumulation, on-site management and transportation of hazardous waste.	ARAR for on-site management and disposal of hazardous waste.
	Air Quality Regulations	NJAC 7:27	Provides requirements applicable to air pollution sources.	ARAR for the generation of fugitive particulate emissions from earth moving activities.
	Technical Requirements for Site Remediation	NJAC 7:26E	Specifies standards for investigation, remediation, and closure at contaminated sites.	TBC for selected substantive standards for sampling and analysis during remediation activities.

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TABLE 36 (Sheet 9 of 9)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
AND REQUIREMENTS TO BE CONSIDERED (TBCs)

ARAR/TBC TYPE	REQUIREMENT	CITATION	DESCRIPTION	COMMENTS
ACTION				
	(Continued)			
	Water Pollution Control Regulations	NJAC 7:14A	Rules regarding discharges of wastewater to surface waters, groundwater and publicly owned treatment works.	ARAR for discharges of on-site generated stormwater and/or sediment dewatering water.
	Treatment Works Approvals	NJAC 7:14A-22	Design and construction standards for wastewater treatment systems.	ARAR specifying treatment requirements, effluent standards for on-site treatment of wastewater including sediment dewatering effluent.
	Soil Erosion and Sediment Control	NJSA 4:24	Requires the implementation of soil erosion and sediment control measures for activities disturbing over 5,000 square feet of surface area of land.	ARAR for site activities involving excavation, grading or other soil disturbance activities exceeding 5,000 square feet. Will specify design installation, inspection and maintenance of erosion and sedimentation controls.
	Well construction and maintenance; sealing of abandoned wells	NJAC 7:9D-1 et. seq.	Provides requirements for installing and abandoning wells, permitting of wells, and licensing of well drillers.	ARAR for site activities involving wells used for sampling and monitoring.

TABLE 37 (Sheet 1 of 2)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE
ARARs AND TARGET CLEANUP LEVELS

Constituent[6]	Groundwater[1]	Sediment[1]	Surface Water[1]	Soil[1]
	Most Stringent[2]	Most Stringent[3]	Most Stringent[4]	Most Stringent[5]
Volatile Organics				
Trichloroethene	1	NA[8]	NA	60
1,1,2,2-tetrachloroethane	1	NA	NA	3
Vinyl Chloride	NL[7]	NL	NL	3
1,1-dichloroethane	70	NL	NL	NL
1,2-dichloroethane	2	NL	NL	NL
Semi-Volatile Organics				
Benzo(g,h,i)perylene	-	170	NA	
Indeno[1,2,3-cd]pyrene	-	200	NA	900
Benzo[b]fluoranthene	0.2	-	NA	900
Benzo[k]fluoranthene	0.2	240	NA	900
Chrysene	0.2	340	NA	9000
Benzo(a)pyrene	0.02	370	NA	90
Benzo[a]anthracene	0.1	261	NA	900
Phenanthrene	-	240	NA	NC[10]
Acenaphthene	400	-	NA	100000
Dibenz[a,h]anthracene	0.3	-	NA	90
2,4-Dinitrotoluene	NL	NL	NL	0.8
Bis(2-ethylhexyl)phthalate	6	NL	NL	46000
Hexachlorobenzene	NL	NL	NL	100
Pentachlorophenol	NL	NL	NL	30
Pesticides				
4,4'-DDD	NA	0.0022	NA	3000
4,4'-DDE	NA	0.0022	NA	2000
Dieldren	NA	0.002	NA	4
Endrin aldehyde	NA	0.003	NA	1000
Endosulfan Sulfate	NA	-	NA	18000
ALDRIN	NL	NL	NL	40
Aroclor 1242	NL	NL	NL	490
Aroclor 1248	NL	NL	NL	490
Aroclor 1254	NL	NL	NL	490
Aroclor 1260	NL	NL	NL	490
Total Inorganics				
Antimony	6	-	6	5
Arsenic	8	6	0.017	20 [11]
Barium	2,000	-	2,000	700
Beryllium	4	-	-	0.1
Cadmium	4	0.6	0.54	1
Chromium	100	26	10	38
Copper	1,000	16	4.45	600
Lead	10 [9]	31	0.97	400
Manganese	50	460	50	NC
Mercury	-	0.15	0.012	1
Nickel	100	16	7	130

TABLE 37 (Sheet 2 of 2)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROEBLING STEEL COMPANY SITE
ARARs AND TARGET CLEANUP LEVELS

Constituent[6]	Groundwater[1]	Sediment[1]	Surface Water[1]	Soil[1]
	Most Stringent[2]	Most Stringent[3]	Most Stringent[4]	Most Stringent[5]
Silver	2	-	1.9	34
Thallium	NL	NL	NL	0.7
Vanadium	NL	NL	NL	370
Zinc	5,000	-	81	1500
Dissolved Inorganics				
Antimony	6	NA	6	5
Arsenic	8	NA	0.017	20 [11]
Barium	1,000	NA	2,000	700
Beryllium	4	NA	-	0.1
Cadmium	4	NA	0.54	1
Chromium	100	NA	10	38
Copper	1,000	NA	4.45	600
Lead	10 [9]	NA	0.97	400
Manganese	50	NA	50	NC
Mercury	-	NA	0.012	1
Nickel	100	NA	7	130
Silver	2	NA	1.9	34
Thallium	NL	NL	NL	0.7
Vanadium	NL	NL	NL	370
Zinc	5,000	NA	81	1500

Notes:

1. All values are represented as ug/l (parts per billion) except soils concentrations, which are mg/kg (parts per million).
2. Most stringent groundwater concentrations represent the most stringent conditions between NJ Class IIA Groundwater Quality Criteria and Federal MCLs.
3. Most stringent sediment concentrations represent the most stringent conditions between Canadian Low Effects Level (LEL), Canadian Severe Effects Level (SEL), U.S. Effects Range - Low (ER-L) and U.S. Effects Range - Medium (ER-M).
4. Most stringent surface water concentrations represent the most stringent conditions between Minimum Surface Water Aquatic Dissolved Standards (SWAQD), Minimum Surface Water Aquatic Total Standards (SWAQT) and Minimum Surface Water Human Health Total Standards (SWHHT).
5. Most stringent soil concentrations represent the most stringent conditions between EPA Soil Screening Levels (Migration to Groundwater, Ingestion and Inhalation), and NJDEP Soil Cleanup Criteria (Impact to Groundwater, Non-Residential Direct Contact and Residential Direct Contact).
6. The constituents listed in this table are based on the Contaminants of Potential Concern (COPCs), as discussed in Section 6.2.2 of the RI.
7. NL = Not listed as a COPC for this medium.
8. NA = Not analyzed.
9. Although the GWQC for lead is 5 ug/L, the Practical Quantitation Limit (PQL) is 10 ug/L. NJDEP policy is to use the higher of the GWQC or PQL as the cleanup value.
10. NC = No criterion derived for this contaminant.
11. The selected value for most stringent criterion for arsenic is the NJDEP Soil Cleanup Criterion for Direct Contact. The EPA SSL for ingestion value of 0.4 mg/kg is more stringent; however, use of this criterion would not provide for meaningful discussion since all detected concentrations exceed this value.

TABLE 38

SUMMARY OF COST ESTIMATES FOR SOIL ALTERNATIVES

SOIL ALTERNATIVE DESCRIPTION	TOTAL CAPITAL COST	ANNUAL O&M COST	TOTAL PRESENT WORTH
SL1 - No Action	$0	$0	$54,000
SL2 - Limited Action	$1,731,000	$318,000	$5,869,000
SL3 - Containment	$20,092,000	$212,000	$24,422,000
Option A - Soil/Asphalt	$16,839,000	$178,000	$20,479,000
Option B - Soil Only			
SL4 - Source Removal and Off-Site Disposal	$649,931,000	$0	$649,931,000

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TABLE 39

SUMMARY OF COST ESTIMATES FOR SEDIMENT ALTERNATIVES

SEDIMENT ALTERNATIVE DESCRIPTION	TOTAL CAPITAL COST	ANNUAL O&M COST	TOTAL PRESENT WORTH
SD1 - No Action	$0	$0	$54,000
SD2 - Limited Action	$21,000	$47,000	$656,000
SD3 - Containment	$4,218,000	$62,000	$5,144,000
SD4 - Dredging, Dewatering and Off-Site Disposal	$19,279,000	$0	$19,279,000
SD5 - Dredging, Dewatering and On-Site Disposal	$11,354,000	$0	$11,354,000

TABLE 40

SUMMARY OF COST ESTIMATES FOR GROUNDWATER ALTERNATIVES

GROUNDWATER ALTERNATIVE DESCRIPTION	TOTAL CAPITAL COST	ANNUAL O&M COST	TOTAL PRESENT WORTH
GW1 - No Action	$0	$0	$54,000
GW2 - Limited Action	$15,000	$50,000	$686,000
GW4 - Restoration (Extraction Wells for Pump and Treat)	$3,455,000	$768,000	$13,043,000 *

* The cost of complete source removal, which is critical to the success of groundwater restoration, is $649,931,000.

APPENDIX III

ADMINISTRATIVE RECORD INDEX

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ROEBLING STEEL COMPANY SITE
OPERABLE UNITS THREE AND FIVE
ADMINISTRATIVE RECORD
INDEX OF DOCUMENTS

1.0 SITE IDENTIFICATION

1.5 Operable Unit 3 Information

Note that documents originally titled Operable Unit 2 contain information on both Operable Units 2 and 3.

P. 100001 - 100047 Report: Roebling Steel Superfund Site, Operable Unit 2, Remedial Action Design, Contract No. DACW41-92-D-0004, Work Plan, Volume 1 of 4, prepared by URS Consultants, Inc., prepared for Department of the Army, Kansas City District, Corps of Engineers, August 1992.

P. 100048 - 100125 Report: Roebling Steel Superfund Site, Operable Unit 2, Remedial Action Design, Contract No. DACW41-92-D-0004, Sampling Plan, Volume 2 of 4, prepared by URS Consultants, Inc., prepared for Department of the Army, Kansas City District, Corps of Engineers, August 1992.

P. 100126 - 100430 Report: Roebling Steel Superfund Site, Operable Unit 2, Remedial Action Design, Contract No. DACW41-92-D-0004, Chemical Data Acquisition Plan, Volume 4 of 4, prepared by URS Consultants, Inc., prepared for Department of the Army, Kansas City District, Corps of Engineers, August 1992.

P. 100431 - 100588 Report: Roebling Steel Superfund Site, Operable Unit 2, Remedial Action Design, Contract No. DACW41-92-D-0004, Chemical Data Acquisition Plan, Volume 4 of 4, prepared by URS Consultants, Inc., prepared for Department of the Army, Kansas City District, Corps of Engineers, August 1992, Text and Appendix B - revised February 1994.

P. 100589 - 100649 Report: Roebling Steel Superfund Site, Operable Unit 2, Remedial Action Design, Contract No. DACW41-92-D-0004, Stage 2 Sampling Plan, prepared by URS Consultants, Inc., prepared for Department of the Army, Kansas City District, Corps of Engineers, March 1993, Revised September 1993, Revised February 1994, Revised August 1994.

P. 100650 - 100746 Report: Roebling Steel Superfund Site, Operable Unit 2, Remedial Action Design, Contract No. DACW41-92-D-0004, Predesign Investigation Report (PIR), Volume 1 of 4: Report, prepared by URS Consultants, Inc., prepared for Department of the Army, Kansas City District, Corps of Engineers, May 1999.

P. 100747 - 100973 Report: Roebling Steel Superfund Site, Operable Unit 2, Remedial Action Design, Contract No. DACW41-92-D-0004, Predesign Investigation Report (PIR), Volume 2 of 4: Appendices A-F, prepared by URS Consultants, Inc., prepared for Department of the Army, Kansas City District, Corps of Engineers, May 1999.

P. 100974 - 101343 Report: Roebling Steel Superfund Site, Operable Unit 2, Remedial Action Design, Contract No. DACW41-92-D-0004, Predesign Investigation Report (PIR), Volume 3 of 4: Appendices G-O, prepared by URS Consultants, Inc., prepared for Department of the Army, Kansas City District, Corps of Engineers, May 1999.

P. 101344 - 101751 Report: Roebling Steel Superfund Site, Operable Unit 2, Remedial Action Design, Contract No. DACW41-92-D-0004, Predesign Investigation Report (PIR), Volume 4 of 4: Appendices P-U, prepared by URS Consultants, Inc., prepared for Department of the Army, Kansas City District, Corps of Engineers, May 1999.

3.0 REMEDIAL INVESTIGATION

3.3 Work Plans

P. 300001 - 300231 Report: Final Project Plans, Volume 1 of 2, Final Work Plan, Supplemental Remedial Investigation, Roebling Steel Company Site, Florence Township, New Jersey, prepared by Ebasco, prepared for U.S. EPA, Region II, December 1995.

P. 300232 - 300566 Report: Report: Final Project Plans, Volume 2 of 2, Field Operations Plan, Supplemental Remedial Investigation, Roebling Steel Company Site, Florence Township, New Jersey, prepared by Ebasco, prepared for U.S. EPA, Region II, December 1995.

P. 300567 - 300633 Report: Final Work Plan Addendum Supplemental Remedial Investigation, Roebling Steel Company Site, Florence Township, New Jersey, prepared by Foster Wheeler Environmental Corporation, prepared for U.S. EPA, Region II, February 1998.

3.4 Remedial Investigation Reports

P. 300634 - 301457 Report: Final RI Report Revision No. 1 OU-5 Remedial Investigation, Roebling Steel Company Site, Florence Township, New Jersey, Volume I of IV, prepared by Foster Wheeler Environmental Corporation, prepared for U.S. EPA, Region II, May 2002.

P. 301458 - 302751 Report: Final RI Report Revision No. 1 OU-5 Remedial Investigation, Roebling Steel Company Site, Florence Township, New Jersey, Volume II of IV, prepared by Foster Wheeler Environmental Corporation, prepared for U.S. EPA, Region II, May 2002.

P. 302752 - 303547 Report: Final RI Report Revision No. 1 OU-5 Remedial Investigation, Roebling Steel Company Site, Florence Township, New Jersey, Volume III of IV, prepared by Foster Wheeler Environmental Corporation, prepared for U.S. EPA, Region II, May 2002.

P. 303548 - 304700 Report: Final RI Report Revision No. 1 OU-5 Remedial Investigation, Roebling Steel Company Site, Florence Township, New Jersey, Volume IV of IV, prepared by Foster Wheeler Environmental Corporation, prepared for U.S. EPA, Region II, May 2002.

3.5 Correspondence

P. 304701 - 304702 Letter to Ms. Tamara Rossi, Project Manager, U.S. EPA, Region II, from Mr. S. Vijayasundaram, P.E., Site Manager, State of New Jersey Department of

Environmental Protection, re: Roebling Steel Superfund Site - OU5, Response to Comments Document to the Final Draft Remedial Investigation Report (Revision No. 2) - Review Comments, April 23, 2002.

P. 304703 - 304704 Letter to Ms. Tamara Rossi, Project Manager, U.S. EPA, Region II, from Ms. Julia L. Barringer, United States Department of the Interior, U.S. Geological Survey, re: Comments on the Final Remedial Investigation for the Roebling Steel Company Site, April 29, 2002.

4.0 FEASIBILITY STUDY

4.3 Feasibility Study Reports

P. 400001 - 400090 Report: Reuse Assessment Report for the Roebling Steel Superfund Site Block 126.01, Lots 1 and 2.01; Block 139, Lots 1, 2, and 3; Block 141.01, Lots 2.01, 2.02, and 7; Township of Florence, Burlington County, New Jersey, prepared by PMK Group, prepared for Burlington County Board of Chosen Freeholders, Office of Land Use Planning, January 2002.

P. 400091 - 400456 Report: Final Feasibility Report for Operable Unit Nos. 3 & 5, Roebling Steel Company Site, Florence Township, New Jersey, prepared by Foster Wheeler Environmental Corporation, prepared for U.S. EPA, Region II, July 2002.

P. 400457 - 400507 Report: Draft Bald Eagle Biological Assessment, Roebling Steel Company Site, Florence Township, New Jersey, prepared by Foster Wheeler Environmental Corporation, prepared for U.S. EPA, Region II, November 2002.

P. 400508 - 400543 Report: Draft Shortnose Sturgeon Biological Assessment, Roebling Steel Company Site, Florence Township, New Jersey, prepared by Foster Wheeler Environmental Corporation, prepared for U.S. EPA, Region II, November 2002.

4.6 Correspondence

P. 400544 - 400560 Letter (w/attachment) to Honorable Carol M. Browner, Administrator, U.S. EPA, from Dr. Joan Daisey, Chair, Science Advisory Board, Dr. Hilary Inyang, Chair, Environmental Engineering Committee, Science Advisory Board and Dr. Domenico Grasso, Chair, Leachability Subcommittee, Environmental Engineering Committee, re: Waste Leachability: The Need for Review of Current Agency Procedures, February 26, 1999.

P. 400561 - 400565 Letter (w/attachment) to Mr. Christopher Mantzaris, Assistant Regional Administrator for Protected Resources, National Marine Fisheries Service, from Mr. Robert W. Hargrove, Chief, Strategic Planning and Multi-Media Programs Branch, U.S. EPA, Region II, re: Ongoing consultation with the National Marine Fisheries Service concerning possible presence of the shortnose sturgeon in the vicinity of the Roebling Steel Company Superfund site, November 5, 1999.

P. 400566 - 400567 Letter to Mr. Robert W. Hargrove, Chief, Strategic Planning and Multi-Media Programs Branch, U.S. EPA, Region II, from Mr. Christopher Mantzaris, Assistant Regional Administrator for Protected Resources, United States Department of Commerce, National Oceanic and Atmospheric Administration, re: Roebling Steel Company Superfund site (OU-3), Florence, NJ, December 3, 1999.

P. 400568 - 400569 Letter to Ms. Tamara Rossi, Project Manager, U.S. EPA, Region II, from Ms. Julia L. Barringer, United States Department of the Interior, U.S. Geological Survey, re: Comments on the Final Draft Revision No. 1, OU-5 Feasibility Study Report for the Roebling Steel Company Site, Florence, New Jersey, May 15, 2002.

P. 400570 - 400572 Letter to Ms. Mindy Pensak, U.S. EPA, Region II, from Mr. Timothy J. Kubiak, Assistant Field Supervisor, United States Department of the Interior, Fish and Wildlife Service, re: March 2002 Final Revision No. 1, Feasibility Study Report, OU-5 for the Roebling Steel Company site, May 16, 2002.

P. 400573 - 400580 Letter to Ms. Tamara Rossi, Project Manager, U.S. EPA, Region II, from Mr. S. Vijayasundaram, P.E., Site Manager, State of New Jersey Department of Environmental Protection, re: OU-5 Final Draft (Revision 1) Feasibility Study Report (including OU-3) and Response to Comments (March 2002), May 23, 2002.

P. 400581 - 400697 Letter to Mr. Pat Evangelista, U.S. EPA, Region II, from Mr. Thomas L. Brand, P.E., Project Review Branch Head, Delaware River Basin Commission, re: Final Draft Feasibility Study Report (Revision 1), Operable Unit 5, Roebling Steel Site - USEPA Superfund Site, Florence Township, Burlington County, New Jersey, DRBC Water Quality Zone 2 - Docket No. D-83-8, May 23, 2002. (Attachment: Report: Administrative Manual - Part III, Water Quality Regulations, Revised to Include Amendments Through October 23, 1996, prepared by Delaware River Basin Commission, undated.

P. 400698 - 400699 Letter to Mr. Edward Putnam, Assistant Director, NJDEP, from Ms. Carole Petersen, Chief, New Jersey Remediation Branch, re: Final Draft Feasibility Study Report (Revision No. 1), Roebling Steel Site, Florence Township, New Jersey, August 12, 2002.

P. 400700 - 400715 Memorandum (w/attachment) to Mr. Matthew Charsky, Regional Coordinator, U.S. EPA, from Mr. Emmet C. Keveney, P.E., Remedial Project Manager, U.S. EPA, Region, II re: Roebling Steel Company Superfund Site: Final Draft Consideration Memorandum Discussing Sediment Remediation Principles, November 12, 2002.

P. 400716 - 400724 Letter to Mr. Emmet Keveney P.E., Remedial Project Manager, U.S. EPA, Region, II, from Mr. Clifford G. Day, Supervisor, U.S. Department of the Interior, Fish and Wildlife Service, re: Review of November 2002 Draft Bald Eagle Biological Assessment, Roebling Steel Company Site (draft BA), April 3, 2003.

10.0 PUBLIC PARTICIPATION

10.3 Public Notices

P. 10.00001 -Notice: The USEPA announces a Proposed Plan
10.00001 (OU5), Proposed Change to Remedy (OU3), and Public Comment Period for the Roebling Steel Company Superfund Site, Burlington County, Roebling, New Jersey, undated.

10.6 Fact Sheets and Press Releases

P. 10.00002- Community Update Superfund Program, Roebling Steel
10.00003 Burlington County, New Jersey, prepared by U.S. EPA, Region II, August 2003.

P. 10.00004 -Press release: EPA Proposes Cleanup Plan for
10.00005 Roebling Superfund Site, prepared by U.S. EPA, Region II, August 22, 2003.

10.9 Proposed Plan

P. 10.00006 -Plan: Superfund Program Proposed Plan, Roebling
10.00034 Steel Company Site, prepared by U.S. EPA, Region II, August 2003.

P. 10.00035 -Letter to Mr. Richard Brook, Administrator,
10.00035 Florence Township, New Jersey, from Ms. Tamara Rossi, Project Manager, U.S. EPA, Region II, re: Proposed Plan for the fourth and final Record of Decision for the Roebling Steel Company Site, August 19, 2003. (No Attachment).

P. 10.00036 -Letter to Ms. Marion Huebler, Librarian, Florence
10.00036 Township Public Library, New Jersey, from Ms. Tamara Rossi, Project Manager, U.S. EPA, Region II, re: Proposed Plan for the fourth and final Record of Decision for the Roebling Steel Company site, August 19, 2003. (No Attachment).

P. 10.00037 -Letter to Mr. Edward Putnam, Assistant Director,
10.00037 NJDEP, from Ms. Carole Petersen, Chief, New Jersey Remediation Branch, U.S. EPA, Region II, re: Proposed Plan for the Roebling Steel Site, August 19, 2003. (No attachment).

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11.0 TECHNICAL SOURCES AND GUIDANCE DOCUMENTS

11.1 EPA Headquarters

P. 11.00001- 11.00001 Report: Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration, Interim Final, prepared by U.S. EPA, Office of Solid Waste and Emergency Response, September 1993. (Title page only).

P. 11.00002- 11.00002 Memorandum to Regional Directors, U.S. EPA, from Mr. Stephen D. Luftig, Acting Director, Office of Emergency and Remedial Response, U.S. EPA, re: Consistent Implementation of the FY 1993 Guidance on Technical Impracticability of Ground-Water Restoration at Superfund Sites, January 19, 1995. (Page 1 only).

P. 11.00003- 11.00003 Fact Sheet: The Role of Cost in the Superfund Remedy Selection Process, prepared by U.S. EPA, Office of Emergency and Remedial Response, September 1996. (Page 1 only).

11.2 EPA Regional Guidance

P. 11.00004 - 11.00004 Report: Technical Assistance Document for Complying with the TC Rule and Implementing the Toxicity Characteristic Leaching Procedure (TCLP), prepared by U.S. EPA, Region II, Revised May, 1994. (Title page only).

APPENDIX IV

STATE CONCURRENCE LETTER

State of New Jersey
Department of Environmental Protection

James E. McGreevey
Governor

Bradley M. Campbell
Commissioner

SEP 30 2003

Ms. Jane M. Kenny
Regional Administrator
USEPA - Region II
290 Broadway - Floor 19
New York, NY 10007 - 1866

Subject: Roebling Steel Superfund Site – Florence Township
Record of Decision (ROD) - Operable Unit 5 (OU-5)
And Proposed changes to OU-3 Remedy

Dear Ms. Kenny:

The Department of Environmental Protection has evaluated and concurs with the Roebling Steel Site Superfund ROD for OU-5 which addresses the remedy for the OU-5 Area of the Roebling site (soils and groundwater) and amendments to the signed ROD for OU-3 slag area.

The Department is aware that this ROD represents the fourth and the final ROD for the site. The first ROD was signed in March 1990 and the Remedial Action was completed in September 1991. The second ROD was signed in September 1991 to address the southeast playground (OU-2) and a 34-acre slag disposal area (OU-3). The Region II Removal Action Branch conducted the cleanup of the playground (OU-2) in the fall of 1994. The Corps of Engineers completed the draft 95% design plans and specifications for the slag disposal area (OU-3). The third ROD for OU-4, signed in September 1996, addressed the remedy for 70 on-site contaminated buildings. The Region II Removal Action Branch has performed decontamination and demolition of buildings, abatement of friable asbestos, disposal of scrap metal from buildings, off-site disposal of process dust and the contents of above-ground tanks, pits and sumps, and removal of underground chemical and oil lines. The OU-4 Remedial Action is still ongoing. This OU-5 ROD addresses the area-wide contaminated soils, river and creek sediments, and ground water.

The specific components of the selected remedy outlined in the ROD for OU-5 include the following:

- Containment of site-wide contaminated soils, including the slag area, by capping with soil/asphalt or soil only and vegetation of the soil cap areas;
- Dredging all contaminated sediments, dewatering the dredged sediments, on-site disposal of the sediments, and site restoration;
- Long term ground water monitoring with institutional controls to restrict ground water use (Deed Notice or Classification Exception Area).

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* Technical Impracticability (TI) Waiver on Ground Water:

The NJDEP concurs that the selected remedy is protective of human health and the environment, and is cost effective. . NJDEP's concurrence with the waiver of its ground water standards is specific to this site only and is based upon facts present in the matter. NJDEP reserves the right to revisit this issue at the time of the five-year review, as required by 42 USC 9621(c), in the event that technological advances no longer support a waiver of the State's ground water criteria.

The State of New Jersey appreciates the opportunity to participate in the decision making process and looks forward to future cooperation with the USEPA.

Sincerely,

Evan Van Hook
Assistant Commissioner

Attachment: Roebling ROD (OU-5)

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APPENDIX V

RESPONSIVENESS SUMMARY

APPENDIX V

Responsiveness Summary

Operable Unit 5 and
Amendment to Operable Unit 3 Selected Remedy

Roebling Steel Superfund Site

INTRODUCTION

This Responsiveness Summary provides a summary of the public's comments and concerns regarding the Proposed Plan for the Roebling Steel Site (Site), and the EPA's responses to those comments. At the time of the public comment period, EPA proposed preferred alternatives for soil, sediment and groundwater contamination, collectively designated Operable Unit 5 (OU5), and changes to the 1991 Operable Unit 3 (OU3) Remedy for the Slag Area. All comments summarized in this document have been considered in EPA's final decision for selection of remedial alternatives for OU5 and OU3.

EPA held a public comment period to solicit community input and ensure that the public remains informed about site activities. EPA's Proposed Plan for OU5 was released to the public on August 21, 2003. A copy of the Proposed Plan was placed in the Administrative Record and was made available in the information repository at the Florence Township Public Library, Roebling, New Jersey, and the Florence Township Municipal Building, Florence, New Jersey. A public notice was published in Burlington County Times and the Bordentown Register News, advising the public of the availability of the Proposed Plan. The notices also announced the opening of a public comment period and invited all interested parties to attend an upcoming public meeting. The public comment period closed on September 19, 2003.

The public meeting to present the preferred remedial alternatives for OU5 and OU3 was held at the Florence Township Municipal Building located on Broad Street, Florence, New Jersey on August 28, 2003.

This Responsiveness Summary is divided into the following sections:

I. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS: This section provides the history of community involvement and interests regarding the Roebling Steel Site.

II. PUBLIC MEETING OVERVIEW: This section briefly describes the public meeting held on August 28, 2003 and includes historical information about the Roebling Steel Site along with the proposed remedial alternatives to clean up the Site.

III. COMPREHENSIVE SUMMARY OF MAJOR QUESTIONS, COMMENTS, CONCERNS AND RESPONSES: This section contains summaries of oral comments received by EPA at the public meeting, EPA's responses to these comments, as well as responses to written comments received during the public comment period.

The last section of this Responsiveness Summary includes attachments, which document public participation in the remedy selection process for this Site. They are as follows:

ATTACHMENT A contains the Proposed Plan that was distributed to the public for review and comment;

ATTACHMENT B contains the public notices that appeared in Burlington County Times and the Bordentown Register News;

ATTACHMENT C contains the public meeting sign-in sheet.

I. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

Local officials and township residents first learned of the Roebling Site's Superfund status in September 1983 through media announcements. At that time, local officials maintained that they were not adequately briefed prior to the release of the information to the media and that communication lines between local and State or federal officials were uncertain.

Since then, the level of community involvement and concern with the Site has been high. EPA has conducted an extensive community relations program to meet the community's need for information and to support community participation in seeking remedies for the Site. Since 1990, EPA has held several public meetings and public availability sessions, and attended town council and other local community group meetings, in an effort to keep residents and local officials informed of the site-related activities. In addition to the public participation responsibilities associated with the OU1, OU2, OU3, and OU4 remedies, EPA has provided the community with fact sheets on the Site.

EPA has participated in a number of health-related activities related to this project. In April 1995, EPA sampled Mansfield Township residents' private wells, as a follow-up to an initial study conducted by the Burlington County Health Department (BCHD). In November 1995, EPA conducted a site visit with New Jersey Department of Health (NJDOH), Agency for Toxic Substances and Disease Registry (ATSDR), and BCHD. During January 1990, April 1995, and September 1995, EPA supported BCHD in conducting Roebling community lead screening for children.

To this day, community interest in the cleanup of the Site remains high. Many residents believe that an effective cleanup of the Site would enhance civic pride and make the community more attractive to tourists and to industry. The main areas of concern for the community include: aesthetic concerns during and following remediation; public health and safety issues, e.g., site security measures, contaminant releases during excavation, long-term health risks; use of local labor resources during remediation; availability of funding to complete site cleanup; and future economic potential of the Site.

II. **PUBLIC MEETING OVERVIEW**

The public meeting for the Roebling Steel Site began at approximately 7:00 p.m. on August 28, 2003 with presentations by EPA, and its contractor, Foster Wheeler Environmental Corporation. Immediately afterward, a representative from Senator Frank Lautenberg's office read a letter that the Senator wrote to EPA Regional Administrator Jane Kenny requesting EPA to provide the full funding necessary to address the contaminated soil and sediments at the Site and to complete the demolition of buildings on-site. Question and answer sessions were also conducted. Approximately 38 residents and local officials attended the meeting.

EPA representatives were Jeff Josephson, Team Leader for EPA; Tamara Rossi, Remedial Project Manager, for the Site; Michael Sivak, Risk Assessor, and Pat Seppi, Community Relations Coordinator. Foster Wheeler Environmental Corporation representatives were Edward Leonard, Project Manager, and Robert Chozick, Feasibility Study Lead.

Ms. Seppi introduced each of the speakers and explained that the purpose of the meeting was to present EPA's Proposed Plan for the cleanup of OU5 and to present proposed changes to the selected remedy for the Slag Area (OU3) previously identified in the September 1991 Record of Decision (ROD). Ms. Seppi explained that the community's concerns would be factored into EPA's next

ROD (the fourth ROD) for the Site, expected in September 2003. Ms. Seppi informed the audience that EPA would accept comments throughout the remainder of the public comment period scheduled to close on September 19, 2003. Ms. Seppi also informed the group that the RI and FS Reports and other site-related documents are available for public review at the local information repositories listed in the Proposed Plan. Copies of the Proposed Plan were available for the taking at the meeting. Ms. Seppi then introduced Ms. Rossi.

Ms. Rossi presented an update of some of the activities that EPA will be involved with at the Site. She announced that EPA will restart the building demolition at the Site. She also reported that EPA will move forward with the remediation and restoration of the Main Gate House and ambulance garage, and that EPA will start the design of the cap for the soil surrounding the Main Gate House. EPA's goal is to complete these activities by Spring 2005. A fact sheet that discusses these activities was available at the meeting for those who were interested.

Mr. Josephson presented a brief overview of how the Superfund process works. He described how a site may be placed onto the National Priorities List and how a remedy is selected. He indicated that sites such as Roebling are often complex and are frequently addressed in stages called operable units. Studies conducted to characterize contamination and evaluate the risks to human health and the environment are reported in the RI and the results of studies to identify and evaluate remedial alternatives to address the site contamination are reported in the FS. Once the FS is completed, EPA develops a Proposed Plan and presents EPA's preferred cleanup alternative to the public.

Mr. Josephson went on to say that public participation is an important element of the Superfund process. EPA provides the public an opportunity to comment on the results of the studies and the proposed remedy. After considering public comments, EPA will document the selected cleanup alternative in the ROD. Once the ROD is final, the remedial design process begins where the specifications and plans for the selected remedy are developed. Remedial action is initiated after the design is completed and is the stage where construction and cleanup activity occur at a site.

Ms. Seppi then turned the floor over to Mr. Leonard. Mr. Leonard summarized the results of the May 2002 Remedial Investigation Report (RI), the July 2002 Feasibility Study Report (FS), and the August 2003 Proposed Plan for remedial action for OU5 and also discussed the proposed changes to OU3. Mr. Leonard provided some background about the five operable units identified at the Site to date and discussed some of the previous activities that have taken place. Mr. Leonard described the different RI studies performed over the past 13 years and summarized the findings, organized by four media (soils, groundwater, surface water, and sediment). Mr. Leonard then discussed the risks posed by these findings, as described in the RI. Mr. Leonard explained that once EPA set the objectives for cleanup of the Site, the FS studied various alternatives to determine which may be successfully implemented. EPA compared a number of alternatives including a No Action Alternative (required in all Superfund Feasibility Studies). Each alternative is summarized in the Proposed Plan along with the rationale EPA developed for selection of a preferred alternative for the various media.

Ms. Seppi then invited the stakeholders present at the meeting to offer comments and ask questions. EPA and Foster Wheeler Environmental responded to questions and comments.

III. COMPREHENSIVE SUMMARY OF MAJOR QUESTIONS, COMMENTS, CONCERNS, AND RESPONSES

Oral Comments Received at the Public Meeting

Issues and comments raised during the public comment period regarding the fourth ROD for the Site are summarized below and are organized into the following categories:

A. Health Risks
B. Proposed Remedy
C. Crafts Creek
D. Groundwater
E. Historical Conditions
F. Site Funding and Time Frames
G. Future Land Use
H. Administrative Items

A. HEALTH RISKS

COMMENT #1: Concerns were expressed about the potential health effects of the Slag Area especially on young people who played on the piles in the past.

EPA RESPONSE: The risk assessments performed focused on potential risks to human health for individuals who are exposed to the Site in its current condition. The risk assessment cannot evaluate how people may have been exposed in the past. The purpose of the risk assessment is to identify what risks are associated with the Site in its current condition and what risks could occur if no further action is taken at the Site. The risk assessment evaluated potential health risks associated with exposure to surface soil (including the slag piles). As the risk estimates exceed benchmark levels, the proposed remedial activities include measures to mitigate this risk.

COMMENT #2: A stakeholder asked if there is a risk to children who fish and swim in Crafts Creek. The fishing advisories that were formerly in the area have been torn down. The stakeholder suggested that EPA should fence off access to Crafts Creek.

EPA RESPONSE: There are no fish consumption advisories specific to Crafts Creek; however, the New Jersey Department of Environmental Protection (NJDEP) and Department of Health and Senior Services (NJDHSS) have issued several advisories for the area. An advisory on the lower Delaware River between Phillipsburg, New Jersey to the Pennsylvania and Delaware borders which encompasses Crafts Creek, was issued for PCB exposure from consumption of American eel, Striped bass and Channel catfish. An advisory on mercury consumption was also issued for the Delaware River between Trenton and Camden for the consumption of largemouth bass.

The NJDEP and NJDHSS are not required to post signs nor fence off the areas under each advisory. These advisories are meant to be a public health notice and guideline for the public for consumption of specific species. However, they are required to notify the public of the advisory via a public forum (i.e., website, fishing license, public meetings). Many times, the NJDEP and NJDHSS will post signs, but due to the lack of sign maintenance, this method of communication is not enforced. If these advisories are converted into bans backed by a regulation, the NJDEP and NJDHSS will post signs on private and public properties as well as fence off the area if necessary.

For more information, contact the NJDEP-Division of Science, Research and Technology, Gary Bucchanin (609-633-8457) as well as its website of fish advisories: http://www.state.nj.us/dep/dsr/njmainfish.htm.

The risk assessment performed for the Site did evaluate ingestion of, or dermal contact with surface water during wading in Crafts Creek, and found that all exposures associated with Crafts Creek surface water are acceptable, both in terms of cancer and non-cancer risks.

COMMENT #3: A stakeholder expressed concern about perimeter air quality sampling and dust migration. He requested EPA to provide collected data to the public.

EPA RESPONSE: EPA has performed air monitoring at the Site perimeter during construction activities throughout the years in accordance with EPA-approved Health and Safety Plans. The results of the air monitoring are available upon request, and have been provided to Florence Township in the past. Dust suppression activities have also been conducted during active work, and would be properly adjusted to take into consideration weather conditions. The local residents have generally expressed satisfaction with our ongoing dust suppression efforts at the Site.

COMMENT #4: A stakeholder asked if there is a risk due to contamination to children who ice skate on Crafts Creek when it is frozen.

EPA RESPONSE: The risk assessment performed for the Site did not evaluate possible risks for adults and children exposed to frozen sediment and surface water in Crafts Creek. However, the results indicate that all exposures associated with the Delaware River and Crafts Creek sediments and surface water are acceptable, both in terms of cancer and non-cancer risks, and would almost certainly be overestimates for risk associated with ice skating.

COMMENT #5: A long-time resident of Roebling asked if and why the contamination presents a threat to human health since he knows of so many people who lived in the community who did not become ill.

EPA RESPONSE: EPA's risk assessment process is designed to address two questions. First, based on the information available regarding how people might be exposed to the site under current conditions, would we expect to see health effects in the population based on current exposures to the contamination? Second, considering how the site might be used in the future and how people might be exposed to contamination under future site conditions, would we expect to see health problems across the population if no remediation occurs? Since there is no way to know how people might have been exposed in the past, or what people might have been exposed to, EPA's risk assessment process cannot predict health effects from past exposures.

COMMENT #6: Are there health studies on effects on workers and nearby residents based on plant conditions that existed when the plant operated from its beginning into the 1950s? Did contaminants from the active plant during 1907 to 1955 affect Roebling's drinking water?

EPA RESPONSE: The risk assessments performed for the Site focused on potential health problems for people who are exposed to the site in its current condition and if no further remedial action is taken. The risk assessments conducted under Superfund do not evaluate how people may have been exposed in the past. It is possible that health studies of workers were performed, but this type of information is not used in the NCP process nor do we have any such studies in our possession. Results of such occupational epidemiological studies are used to evaluate the toxicity of individual chemicals and they may be reflected in the toxicity values used in the risk assessment, but these types of studies are not used on a site-specific basis. EPA does not have the data that would allow it to determine what people could have been drinking when they were using the on-site well as a water supply well.

B. SOIL AND SLAG AREA PREFERRED ALTERNATIVES

COMMENT #7: Local residents expressed concern about the proposed remedy change for the Slag Area. Explain the rationale used to determine the removal of the treatment component from the Slag Area remedy.

EPA RESPONSE: The selected remedy for the Slag Area specified in the 1991 ROD included treatment of hot spots (via stabilization), and soil cap with stormwater management system and shoreline protection. At the time, it was assumed that the slag material hot spots (i.e., those materials exceeding the TCLP limits) were acting as a substantial source of groundwater contamination. These conclusions were based on limited toxicity characteristic leaching procedure (TCLP) testing on the slag material and limited groundwater data from the Slag Area.

During post-ROD investigations, additional TCLP testing was performed, as well as extensive site-wide groundwater, surface water, and sediment investigations. The results of the TCLP investigation resulted in a substantially larger volume of slag material exceeding the TCLP limits for cadmium and lead. However, the analytical results from the groundwater, surface water and sediment investigations indicate that the metal contamination present in the slag material and groundwater does not show a significant impact on the biota in the sediments and the quality of the surface water.

It appears that, while contamination can be leached from the slag under the aggressive conditions present in the TCLP test, these contaminants do not leach from the slag material when exposed to water (i.e., rain infiltration and/or fluctuating groundwater levels) under the conditions found at the Site. Samples indicating groundwater contamination are primarily a result of sampling less-mobile, naturally-occurring particulates with adsorbed contamination or other contaminated particulate matter, and to a much lesser degree, more mobile, dissolved metals contamination due to leaching.

COMMENT #8: What contaminants were found in Roebling Park, and why was contaminated soil removed from the park and not capped?

EPA RESPONSE: Lead and low levels of polychlorinated biphenyls (PCBs) were found in the surface soil located in the Roebling Park. The localized extent of contamination and the regular use by local children and residents made soil removal the preferred remedy over capping in this location.

COMMENT #9: How long is a soil cap effective?

EPA RESPONSE: The cap can effectively prevent direct exposure to contamination indefinitely with periodic inspections and maintenance. Soil cap areas would be vegetated to stabilize the soils and minimize erosion, and a permeable liner would be placed beneath the cap to act as a visible marker to minimize direct contact should the overlying cap be breached. EPA will implement a plan for long-term monitoring of the cap to ensure its integrity, and any erosion or other damage to the cap will be repaired. A deed notice will also be implemented to provide information to the public regarding the presence of the contamination and the cap to prevent unauthorized activities that could compromise the integrity of the cap.

COMMENT #10: How long does it take to dissolve acid slag? Does contamination leach from the slag? Is the slag to be treated to remove carcinogens?

EPA RESPONSE: EPA is not proposing to dissolve or otherwise treat the slag. As discussed above in response to Comment #7, based on limited TCLP and groundwater data, EPA originally proposed treatment of hot spots, via stabilization, to reduce the leaching of contamination from the slag into groundwater. During post-ROD investigations, however, EPA found no convincing evidence that significant contamination is leaching into groundwater from the slag. Therefore, EPA has modified its proposal, eliminating the hot spot treatment of the slag. The Slag Area will still be capped to prevent direct contact with contaminated slag material.

C. CRAFTS CREEK

COMMENT #11: A stakeholder asked if EPA had performed sediment sampling along Crafts Creek, south of Route 130 (upstream of the Site).

EPA RESPONSE: Sediment and surface water samples were collected from three locations south of Route 130 (upstream of the Site).

COMMENT #12: A stakeholder recommended that EPA perform testing in a couple of transects across the ponded area of Crafts Creek to get a representative assessment of the sediment chemistry.

EPA RESPONSE: Additional sampling is planned in Crafts Creek as part of the pre-design sampling activities. The data obtained along with existing information will be used to further delineate the impacted sediment areas.

D. GROUNDWATER

COMMENT #13: A stakeholder commented that the contouring of the inorganic groundwater data produced by the groundwater model should be reviewed since the pictorial presentation of the data give the incorrect impression that the sampling wells may be source points.

EPA RESPONSE: The groundwater data collected to date do not indicate that there are inorganic contaminant plumes at the Site and EPA has not identified specific source areas at sampling well locations. On a sporadic basis, isolated groundwater sample results do indicate inorganic contaminants at concentrations just above groundwater quality standards. The concentrations can change from one sampling event to another and the site monitoring wells with exceedances vary between sampling events. This is not uncommon with low levels of inorganic contamination.

The groundwater model utilized data from one current sampling event and was specifically developed to conservatively assume that there was a plume in the immediate area of any monitoring well that had an inorganic exceedance in order to evaluate the effectiveness of remedial alternatives. The model simulated future groundwater contaminant transport with various remediation scenarios and the results indicate that under the conservative assumptions used in the model, the areas of groundwater contamination were stable even if no groundwater remedial actions were taken.

COMMENT #14: A stakeholder commented that the water level data presented in the RI/FS do not show discharge to Crafts Creek to the extent indicated in the groundwater model. The data may need to be reassessed or recontoured for presentation.

EPA RESPONSE: The RI/FS figures representing water level data indicate some component of flow in the upper sand aquifer to Crafts Creek but not to the extent indicated in the groundwater model. The main component of flow indicated in the RI/FS figures is to the Delaware River. However, the monitoring well network does not extend to Crafts Creek beyond the site boundary, while the model covers a larger area including outside the Site where little field data are available. If data were available, the potentiometric map for the upper sand would probably show a component of flow towards Crafts Creek. However, the current potentiometric maps are correctly drawn with the data available. The additional sediment sampling in Crafts Creek will help to further determine if the creek has been impacted by the discharge of contaminated groundwater from the Site.

COMMENT #15: A local stakeholder asked if contamination has affected the aquifers, groundwater, and sources of the town drinking water.

EPA RESPONSE: No. There are a number of reasons why the contaminants at the Site have not and will not affect the sources of drinking water near the Site including: 1) the inorganic contaminants (metals) are very immobile in the groundwater and do not travel far before they are re-adsorbed onto the soil particles; 2) the groundwater flow in the affected aquifers at the Site is towards the Delaware River and away from the municipal wells; and 3) the municipal wells are in a deeper and different aquifer than the aquifers contaminated at the Site. In addition, the municipal wells are sampled regularly for metals as required by State Law to assure that there are no elevated levels in the drinking water.

COMMENT #16: Are the municipal wells monitored for presence of harmful contaminants?

EPA RESPONSE: Yes. Under Federal and State law, all community public water systems and non-community water systems must test their water on a rigid schedule and at specific locations for inorganics, radionuclides and synthetic organic chemicals. The information is submitted to the NJDEP. The standards are enforced by the NJDEP Bureau of Safe Drinking Water and the Bureau of Water Compliance and Enforcement.

COMMENT #17: Has EPA looked for Polynuclear Aromatic Hydrocarbons (PAHs)in the groundwater?

EPA RESPONSE: During the initial investigations at the Site, groundwater was sampled for PAHs on a number of occasions. The PAHs discovered at the Site were very limited in concentration and extent. Subsequent groundwater sampling focused on inorganics only since they were the main contaminants of concern at the Site.

COMMENT #18: Are there impacts to the Delaware River from contaminants leaching from the slag?

EPA RESPONSE: There is a hydraulic connection between the groundwater in the Slag Area and the Delaware River. The groundwater that moves through the Slag Area discharges directly to the river. Extensive sampling indicates that the surface water has not been adversely impacted by inorganic contamination. However, there are data gaps associated with the impact of discharging potentially contaminated groundwater on the sediment in the Delaware River. Additional sampling will be performed as part of the pre-design sampling activities to fill these data gaps.

E. HISTORICAL CONDITIONS

COMMENT #18: A long-time resident of Roebling and former worker at the Site noted that during the time when the plant was in operation, by-product material was used as fill throughout the town in gardens, streets, alleys, in areas where houses were to be constructed, and in a ravine that once existed below Summer Street. He asks if that material was contaminated?

EPA RESPONSE: Portions of the Village of Roebling were built on filled wetlands along the Delaware River. Fill material could have originated from multiple sources including the Site. EPA will assess historical documentation to determine if by-product material from the Site was possibly used as fill material in the Village.

F. FUNDING AND SCHEDULE

COMMENT #19: Local residents and Senator Lautenberg's representative expressed concern that the full funding necessary to complete the remediation of Roebling has not been committed.

EPA RESPONSE: EPA Region 2 is committed to completing the building demolition work and intends to obligate sufficient funds to continue work in the Fall of 2003. EPA will keep Florence Township, the owner of the Site property, and the local community informed as information regarding the extent of additional funding becomes available.

COMMENT #20: Stakeholders expressed interest in the process by which EPA makes funding decisions, decisions about site priority. What is the composition of the panel that makes decisions about funding Superfund sites? Do they include local representatives? What was the requested funding for Roebling for the FY03 fiscal year?

EPA RESPONSE: In August 1995, EPA established a National Risk-Based Priority Panel of program experts representing all 10 Regions and EPA Headquarters to evaluate the risk at NPL sites ready for construction with respect to human health and the environment. There are no non-Agency personnel represented on the panel. The Agency uses these evaluations to establish funding priorities (i.e., projects are funded, with the exception of emergencies and the most critical removal actions, in order of priority based on panel evaluations). The panel uses the following criteria to evaluate projects: risks to humans; ecological risks; stability of contaminants; contaminant characteristics; and economic, social, and program management considerations. For FY 03, Region 2 requested $5 million dollars to conduct building demolition or decontamination at the Roebling site.

COMMENT #21: When will cleanup be completed?

EPA RESPONSE: Our current estimate, in the absence of any funding constraints, is that the cleanup could be completed within four years. The FS estimate of two to three years for completing the soil, sediment, and groundwater remedy is independent of the work currently underway which addresses buildings and integration with future development. The FS estimate also does not include the time needed to conduct a remedial design. Once the remedial design is completed, construction activities for the soils, sediments and groundwater will commence.

COMMENT #22: How does finding a developer affect remediation funding and schedule?

EPA RESPONSE: Working with a developer may accelerate the remediation schedule. EPA would try to integrate the developer's site improvements into the proposed remedy; thereby, potentially reducing the need for EPA funding. For example, the construction of the New Jersey Transit Light Rail Line parking lot at the Hornberger Avenue entrance is considered part of the proposed site cap.

COMMENT #23: What percent complete is the remediation at the Roebling Steel Company Superfund Site?

EPA RESPONSE: Remediation of the Site is approximately 50 percent complete. This is an approximation based upon past expenditures and anticipated future funding needs as well as consideration of the cleanup accomplished to date.

G. FUTURE LAND USE

COMMENT #24: Local residents expressed a desire to have EPA remove the fence from Roebling Park and allow access to the Delaware River.

EPA RESPONSE: EPA installed the fence to restrict access to the slag material, as it presents a health concern due to dermal contact. Once the OU5 remedy has been implemented, EPA will determine if removal of the fence is appropriate at that time.

COMMENT #25: A stakeholder requested that future plans at Roebling include maintaining access to the interior of the facility using the current access provided from Hornberger Avenue.

EPA RESPONSE: At this current time, there are no EPA plans to limit access to the interior of the facility from the current access provided from Hornberger Avenue. After the remediation is completed, access to the Site will be determined by the land owners/developers in conjunction with the municipal authorities.

COMMENT #26: How does remedy selection affect future site development? For instance, what is the implication for future site use of placing a cap versus excavation and off-site disposal of contaminated media? Are limits placed on Florence Township as a result of remedy selection?

EPA RESPONSE: Limitations in the form of institutional controls such as deed restrictions would be required based on the current proposed remedy. The RI/FS evaluation assumed that future land use would be recreational and commercial. Future residential land use would require additional investigation and potentially future response actions to ensure that the site would be protective for residential land use.

COMMENT #27: Is there flexibility in the plan for site cleanup that will take into account potential future development and/or new innovation or technology that may be applicable in the future?

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EPA RESPONSE: The ROD remedy allows for commercial, recreational, and industrial land uses. Residential land use would require additional investigation, design, or remedial measures to ensure that the Site would be protective for residential land use. The ROD does not specifically allow for new innovation or technology, however, EPA may always reconsider remedies if new information comes to light.

H. EPA ADMINISTRATIVE ITEMS

COMMENT #28: One stakeholder requested EPA to make Site reports available on the EPA Internet web site.

EPA RESPONSE: Currently, RODs are the only project documents usually available on the EPA Internet web page. EPA is assessing its capability to provide additional site documents online in the future.

COMMENT #29: Will minutes of this public meeting be available to the public?

EPA RESPONSE: Meeting Minutes will be made available at the local information repositories. For those who attended the public meeting, copies may be requested and sent directly to them.

Written Comments Received During the Comment Period

One letter was received during the public comment period and it is included herein. Comments from the letter have been extracted, listed below and are followed by EPA's response to each comment.

Letter from Mr. Pierre Lacombe (August 29, 2003)

COMMENT #1: "Fig 1-3 in final report and (fig 3-13 in RI) report show the water table contours. The contours show the predominate flow direction is toward the Delaware with little flow toward Crafts Creek. Because the land is flat, I suspect that the flow especially on the southern half of the site may be more southerly than northerly. The groundwater flow model map shows the water table flow direction as I suspect it to be. If you included either a topographic divide and/or geographic divide of the peninsula then the contour lines would flex around this divide. The groundwater flow direction of the water table aquifer and the first confined aquifer are different by 60 to 90 degrees. This seems incorrect. I would revamp both sets of maps or explain the difference in the text (I did not read the text on this issue)."

EPA RESPONSE: The RI/FS figures representing water level data indicate some component of flow in the upper sand aquifer to Crafts Creek but not to the extent indicated in the groundwater model. The main component of flow indicated in the RI/FS figures is to the Delaware River. However, the monitoring well network does not extend to Crafts Creek beyond the site boundary, while the model covers a larger area including a portion outside the Site where little field data are available. If data were available, the potentiometric map for the upper sand would probably show a component of flow towards Crafts Creek. However, the current potentiometric maps are correctly drawn with the data available. The additional sediment sampling in Crafts Creek will help to further determine if the creek has been impacted by the discharge of contaminated groundwater from the Site.

COMMENT #2: "Fig 14 15 19 21 22 27 28 33 These various QW maps [figures of groundwater contaminants located in the Feasibility Study, Appendix D - entitled "Technical Memorandum, Results of Groundwater Modeling"] have been contoured using some sort of computer contouring package. The data values appear to be contoured without considering the contamination source areas or the ground-water flow direction. It is possible that the EPA strategically located wells in the center of a known contaminant source area. (If that is correct I apologize not reading the full text.) However, contamination contouring around MW42 and around some wells in the center of the factory proper seemed suspect. With the advantage of having stratified QW sampling data (0 to 2 ft; 2 to x ft, and many wells, drive points, and hydropunch QW data as well as some known contamination source areas (e.g. buried drums, pits, leaking service lines, etc.) as well as GW flow direction maps and hydrogeologic framework information it may be to the EPA advantage to contour these multiple type of data along succinct transects in section view. With such a QW map and QW section you may be able to decrease the extent of some of the contamination plumes."

EPA RESPONSE: The groundwater data collected to date do not indicate that there are inorganic contaminant plumes at the Site and EPA has not identified specific source areas at sampling well locations. On a sporadic basis, isolated groundwater sample results do indicate inorganic contaminants at concentrations just above groundwater quality standards. The concentrations can change from one sampling event to another and the site monitoring wells with exceedances vary between sampling events. This is not uncommon with low levels of inorganic contamination.

In order to evaluate the effectiveness of remedial alternatives the groundwater model utilized data from one current sampling event and was specifically developed to conservatively assume that there was a plume in the immediate area of any monitoring well that had an inorganic exceedance. The model simulated future groundwater contaminant transport with various remediation scenarios. Under the conservative assumptions used in the model, the results indicate that the areas of groundwater contamination would be stable even if no groundwater remedial actions were taken.

COMMENT #3: "Fig 2-1 and 3-3: The 5 or 6 shore line sampling sites for sediment in Crafts Creek are the only sites that need to be remediated. Since no samples were collected in the center of Crafts Creek there is no way to assess the contamination in that area. I suspect that if the EPA were to traverse the creek along 3 transects and sample the bottom sediments at 50 or 100 ft spacings then statements concerning the existence of or lack of contamination would be confirmed."

EPA RESPONSE: There are a number of data gaps that will be filled as part of a pre-design sampling phase. This data, collected along with existing information, will be used to develop the remedial design. Additional sampling is planned in Crafts Creek as part of the pre-design sampling activities.

COMMENT #4: "As far as my community is concerned and as a representative of the Florence Township Environmental Commission I would like to see a 300 foot wide access zone from the Roebling Park to the Delaware River as a proto type of the end condition of the Slag Area. Bulldozing the area to a more natural terrain and capping it with a preset thickness of topsoil would be an immediate positive. This would give our residents a safe and pleasant access to the gem of Florence."

EPA RESPONSE: The integration of the future site redevelopment with the surrounding community will be determined by the land owners/developers in conjunction with the municipal authorities.

COMMENT #5: "In figure 1 of the power point presentation Mr. Leonard showed no road access to the interior of Main Plant area. Figure 1 in your evening hand out shows a plausible road access between the NJ Transit parking lot and the Museum property. I would hope that your green booklet map reflects the road access to the interior or the property."

EPA RESPONSE: Figure 1 of the power point presentation was a simplified figure for presentation purposes only. At this current time there are no EPA plans to limit access to the interior of the facility from the current access provided from Hornberger Avenue.

ATTACHMENT A

Responsiveness Summary

Superfund Program
Proposed Plan

Roebling Steel Company Site
August 2003

U.S. Environmental Protection Agency, Region II

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EPA ANNOUNCES PROPOSED PLAN

This Proposed Plan describes the remedial alternatives that the U.S. Environmental Protection Agency (EPA) considered to remediate contaminated soils, sediments and groundwater at the Roebling Steel Company Superfund Site (Site) located in Florence Township, New Jersey and identifies EPA's preferred alternative with the rationale for this preference. This document is issued by the EPA, the lead agency for site activities, in conjunction with the New Jersey Department of Environmental Protection (NJDEP), the support agency for this project.

EPA and NJDEP recommend Soil Alternative 3, Sediment Alternative 5, and Groundwater Alternative 2. The preferred alternative for soils includes site-wide capping of contaminated soils using soil only or a combination of soil/asphalt, and vegetation of the soil cap areas. The type of capping would be based on the physical characteristics of different portions of the site and the future uses of each portion. The preferred alternative for sediments includes dredging the contaminated sediments, dewatering the dredged sediments, on-site disposal, and site restoration. The preferred alternative for groundwater includes a long-term monitoring program and restrictions on groundwater use. All alternatives would require long-term maintenance and monitoring, institutional controls and five-year reviews since contamination would remain on-site.

Dates to remember:
MARK YOUR CALENDAR

PUBLIC COMMENT PERIOD:
August 21 - September 19, 2003
U.S. EPA will accept written comments on the Proposed Plan during the public comment period.

PUBLIC MEETING:
August 28, 2003
U.S. EPA will hold a public meeting to explain the Proposed Plan and all of the alternatives presented in the Feasibility Study. Oral and written comments will also be accepted at the meeting. The meeting will be held at the Florence Township Municipal Building, located at 711 Broad Street in Florence, New Jersey at 7:00 p.m.

For more information, see the Administrative Record at the following locations:

U.S. EPA Records Center, Region II
290 Broadway, 18th Floor.
New York, New York 10007-1866
(212)-637-3261
Hours: Monday-Friday - 9 am to 5 pm

Florence Township Public Library
1350 Hornberger Avenue
Roebling, New Jersey 08554
(609) 499-0143

Florence Township Municipal Building
711 Broad Street
Florence, New Jersey
(609) 499-2525

This document also presents proposed changes to the selected remedy for the Slag Area identified in the September 1991 Record of Decision (ROD). The Slag Area (34 acres) is a portion of the property that was created by filling in the Delaware River with process slag, cinders and other fill material. The slag material consists of very coarse soils composed primarily of residues from the high temperature processing of iron ore. That remedy called for treating hot spots through stabilization, covering the 34-acre Slag Area with a soil cap and vegetation, installing a stormwater management system and shoreline protection, and using institutional controls. EPA recommends removing the treatment component from the original remedy based on new information generated during the most recent Remedial Investigation and Feasibility Study (RI/FS) Reports, dated May 2002 and July 2002, respectively, and other supporting documentation. The analytical results from the hot spot delineation, groundwater, surface water and sediment investigations indicate that the metal contamination present in the slag material and groundwater does not show a significant impact on the biota in the sediments and the quality of the surface water. Most of the groundwater contamination principally results from suspended particulates, and to a much lesser degree, as the result of leaching. For these reasons, it was decided that for the Site, the Toxicity Characteristic Leaching Procedure (TCLP) used as a basis for the 1991 ROD, was not a good indicator of hot spots in the Slag Area and instead, the aforementioned sediment, surface water, and groundwater sampling would be more relevant. Therefore, EPA and NJDEP also recommend Soil Alternative 3 for the 34-acre Slag Area.

EPA is issuing this document as part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA), and Section 300.430 (f)(2) of the National Contingency Plan (NCP). This document summarizes information that can be found in greater detail in the RI/FS report and other supporting documentation. This Proposed Plan is being provided as a supplement to the RI/FS report, to inform the public of EPA's and NJDEP's preferred remedy, and to solicit public comments pertaining to all the remedial alternatives evaluated, as well as the preferred alternative.

The remedy described in this Proposed Plan is the preferred remedy for the Site. Changes to the preferred remedy, or a change from the preferred remedy to another remedy, may be made if public comments or additional data indicate that such a change will result in a more appropriate remedial action. The final decision regarding the selected remedy will be made after EPA has taken all public comments into consideration. We are soliciting public comment on all of the alternatives considered in the detailed analysis of the FS because EPA and NJDEP may select a remedy other than the preferred remedy. Therefore, the public is encouraged to review and comment on all the alternatives considered by EPA in this Proposed Plan.

SITE HISTORY

The Roebling Steel Company Site is a large abandoned industrial facility of approximately 200 acres, adjacent to the Delaware River (Figure 1). The Site is located in the Village of Roebling in Florence Township, Burlington County, New Jersey. The facility was used from 1906 until 1982, primarily for the fabrication of steel products. Over half of the property was created by filling in the Delaware River with process slag, cinders and other fill material, so that, as the plant required additional structures, there would be enough room for expansion. There are numerous buildings that make up the facility; they are connected by a series of paved and unpaved access roads. The Site is bordered by Second Street on the west and Hornberger Avenue on the south. Residential lands are located to the west and southwest of the Site at a zoning density of approximately eight dwellings per acre. Two public playgrounds are adjacent to the Site. The Delaware River forms the northern boundary of the Site, and Crafts Creek forms its eastern boundary. U.S. Route 130 and a Penn Central (Conrail) track are located to the south of the Site.

The groundwater underlying the Site is at the margin of the Potomac-Raritan-Magothy aquifer, designated by the State of New Jersey as a Class 2A drinking water aquifer. The Village of Roebling and Florence Township obtain their potable water from public supply wells located about two miles west of the Site. The city of Burlington, approximately six miles downstream from the Site, obtains potable water from both the Delaware River and shallow groundwater wells. The groundwater flow of the upper and lower aquifers radiates out from the southwest corner of the Site and discharges directly into the Delaware River. At low tide, the Site discharges groundwater to the river, while at high tide the river acts to recharge the aquifer along certain sections of the shoreline. Some shallow groundwater also discharges to the Crafts Creek tidal channel/basin area. This reach of the Delaware River is subjected to tidal influence, with the vertical tidal range measuring approximately eight feet at the Site. There are approximately 25 major municipal and industrial dischargers that are within one tidal excursion from the Site. The area adjacent to the Site is part of a five-mile stretch that does not support fishing; State-wide advisories have been issued on the consumption of certain fish.

Steel production resulted in the generation of significant quantities of waste materials in both liquid and solid forms. The majority of liquid wastes were discharged to Crafts Creek and the Delaware River. The facility contained an underground piping system of storm, sanitary, acid and oil lines, and seven discharge outfalls to the Delaware River and Crafts Creek. The discharge outfalls carried storm water, cooling water, spent acid, acid rinse waters, oily wastewaters, and effluent from the wastewater treatment plant (post-1973) to the Delaware River and Crafts Creek. Large quantities of solid wastes including slag, mill scale, spent refractory materials, and other production residues were disposed of at the Site. No dust control system was in place until 1968; dust would be released within the buildings and directly out the stacks. The years of industrial activities at the Site have resulted in widespread contamination with both organic and inorganic compounds. Previous plant owners and operators of the Site were cited for violating environmental regulations associated with waste handling and disposal during periodic inspections performed by the New Jersey Department of Health and NJDEP. The Site was proposed for inclusion on EPA's National Priorities List of Superfund sites in December 1982, and added to the list in September 1983. In February 1983, the owner abandoned the Site.

In May 1985, EPA began a remedial investigation and feasibility study (RI/FS) to characterize the nature and extent of the contamination present at the Site. Due to the numerous contamination sources, and various pathways for exposure associated with the Roebling Steel Site, EPA is addressing the remediation in a phased approach. Four removal actions have been conducted at the Site. In December 1985, the State of New Jersey removed picric acid and other explosive chemicals from one of the on-site laboratories. EPA performed a removal action between October 1987 and November 1988, that included the removal of lab pack containers and drums containing corrosive and toxic materials, acid tanks, and compressed gas cylinders. EPA conducted another removal action in October 1990 that included fencing a portion of the Slag Area and excavating contaminated soil in an area of the Roebling Park, which borders the facility. In October 1998, EPA initiated a removal action addressing both the interior and exterior asbestos-wrapped piping, and completed this action in November 1999.

The first ROD for the Site was signed in March 1990, and resulted in the completion of a remedial action in September 1991. That remedial action, the first of several anticipated remedial actions, known as operable units (OUs), continued the removal or remediation of contaminated source areas. It included the removal and off-site treatment and disposal of remaining drums, transformers containing oil contaminated with polychlorinated biphenyls (PCBs), the contents of exterior abandoned tanks, a baghouse dust pile, chemical piles, and tire piles.

A second ROD was signed in September 1991, to address the southeast playground (OU2), and a 34-acre Slag Area (OU3). The remedy selected for the southeast playground included excavating contaminated soil hot-spots, off-site treatment, and disposal at an appropriate facility. The Corps of Engineers (COE) was given the responsibility to design and implement the remedies selected in the ROD. To expedite the cleanup of the playground, the EPA Region II Removal Action Branch conducted the cleanup of the playground in the Fall 1994, after the COE submitted a final design to EPA. The remedy selected for the Slag Area included treating hotspots, and then covering the entire 34-acre Slag Area with a soil cap and vegetation. EPA is proposing changes to the selected remedy for the Slag Area as part of this Proposed Plan. The remedial design for the Slag Area cap and shoreline revetment is near completion.

In September 1996, a third ROD was signed by EPA selecting a remedy which includes removal and disposal of the contents from underground storage tanks and underground piping, friable asbestos abatement, decontamination and demolition of buildings, recycling or disposal of scrap metal from building debris and contaminated equipment, off-site disposal of process dust and the contents of above-ground tanks, pits, and sumps, and the restoration of the Main Gate House, (listed on the National Register of Historic Places in 1978 as a property within the Village of Roebling Historic District) and other historic mitigative measures (OU4). The areas of concern (AOCs) that have already been remediated are the following: aboveground and underground storage tanks, friable asbestos, process dust, the contents of pits and sumps, underground oil and chemical lines, soils contaminated with oil, and the landfill. Certain areas of the Site have been investigated (trenching of soils) to search for AOCs. EPA continues to work on the cleanup of the buildings and contamination sources.

The overall strategy for the Roebling Steel Site addresses contamination in a manner that would allow most of the Site to be returned to productive use for industrial, commercial, or recreational purposes. Additional investigations, remediation measures, and institutional controls would be needed for residential use of the property. EPA has completed the remedial actions called for by the first two RODs and the on-going remedial action called for by the third ROD was started in the summer of 1999. EPA will address the remaining cleanup work at the Site in the fourth and final ROD. Concurrent with ongoing design activities, an additional RI/FS was recently completed, which addresses surface and subsurface soils, Delaware River and Crafts Creek surface water and sediments, and groundwater. The RI/FS report forms the basis of this Proposed Plan for the fourth ROD and the proposed changes to the remedy for the Slag Area selected in the 1991 ROD at the Roebling Steel Site. The RI/FS incorporates an extensive data investigation and discussion of potential cleanup alternatives for remaining areas of contamination areas at the Site.

SITE CHARACTERISTICS

EPA, through its contractor, the Foster Wheeler Environmental Corporation (FW), previously known as Ebasco Services, conducted field investigations in multiple phases between November 1985 to April 1998.

RESPONSE ACTIONS	DESCRIPTION AND STATUS
Removal Actions • Removal Action 1 • Removal Action 2 • Removal Action 3	 - Removal of drums, lab pack containers, acid tanks, and compressed gas cylinders. Action completed in 1988. - Removal of contaminated surface soils from the Roebling Park, and installation of a perimeter fence around the Slag Area. Action completed in 1991. - Removal of site-wide asbestos on interior and exterior piping , removal of heavy metal process dust, and liquids and solids from vats and tanks.
ROD 1 (March 1990) • OU-1	 - Removal of drums, transformers, tanks, a baghouse dust pile, chemical piles, tires. Action completed in 1991.
ROD 2 (September 1991) • OU-2 • OU-3	 - Removal of contaminated surface soils from the Southeast Park. Action completed in 1995. - The upcoming ROD Amendment (the subject of this Proposed Plan) would modify the original remedy selected for the Slag Area. Design near completion.
ROD 3 (September 1996) • OU-4	- Remediation of 70 abandoned buildings which contain contaminated process dust, contaminated equipment, tanks, pits and sumps, underground piping. Action was started in the summer of 1999.
ROD 4 **(the subject of this Proposed Plan)** • OU-5	- This ROD will address all remaining contamination problems at the Site, such as the site-wide soils, river and creek sediments and groundwater, and will recommend changes to the selected remedy for the Slag Area identified in the ROD 2. This is the last OU at the Site.

The purpose of these investigations was to determine the nature and extent of contamination of the entire Site. The field work necessary to fully characterize those areas to be included in the fourth ROD was completed in April 1998. Further, a groundwater modeling effort was conducted based on the data gathered during the field investigations which culminated with the development of a technical memorandum in March 2002 on the results of the groundwater modeling and specified in Appendix D of the RI Report. The potential areas of contamination at the Site were addressed in the following investigations and the results can be found in the RI report, which was completed in May 2002:

Geophysical Survey and Test Pit Investigation: potential areas for buried wastes on the Site were identified during the geophysical survey and investigated through test pit excavations.

Surface and Subsurface Soil Investigation: off-site soils, on-site soils, test pit soils, and potential hot spot soils (sludge lagoons, former transformer pads, asbestos soil, oiled roadways, stressed vegetation).

Sediment Investigations: potential impacts to the Delaware River and Crafts Creek from site-originated surface water run-off, sewer outfall, and groundwater discharges; establishing contaminant concentration ranges throughout the Delaware River; macroinvertebrate toxicity and benthic community evaluation; and delineation of sediment hot spots.

Hydrogeologic Investigation: monitoring well installations, hydropunch program, groundwater elevation measurements, on-site groundwater sampling, residential well sampling, groundwater seep sampling, aquifer testing, and abandonment of facility wells.

Surface Water Investigation: potential impacts to the Delaware River and Crafts Creek from site-originated surface water run-off, sewer outfall, and groundwater discharges from the Slag Area and the back channel area; and establishing contaminant concentration ranges throughout the Delaware River.

Ecological Investigation: ecological inventory, wetlands investigation, and biota investigation.

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Air Particulate Investigation: potential impacts of particulates migration to nearby residents and sensitive environments.

Site Surveying and Mapping: establishing a base map for the Site and adjacent areas of Crafts Creek that would depict physical features, sampling locations, topographic data, and site boundaries.

The results of those investigations are summarized in the following sections.

Soils

Exceedances of federal and State criteria noted throughout the Proposed Plan for soil concentrations are based on the most stringent soil criteria represented between EPA Soil Screening Levels (SSL) (Migration to Groundwater, Ingestion and Inhalation) and NJDEP Soil Cleanup Criteria (Impact to Groundwater, Non-Residential Direct Contact and Residential Direct Contact).

Main Plant Surface Soils - Surface soil samples were collected from depths up to and including two feet below ground surface. Inorganic contaminants were detected in all collected site-wide surface soil samples. Concentrations of twelve inorganics exceeded federal and State criteria in one or more of the surface soil samples. The inorganics most frequently exceeding criteria were lead (71 of 121 samples), chromium (70 of 121 samples), and cadmium (55 of 121 samples). Detected concentrations of lead ranged from 2 mg/kg to 69,000 mg/kg, with an average detected concentration of 5,959 mg/kg. Detected concentrations of chromium ranged from 1 mg/kg to 1,950 mg/kg, with an average detected concentration of 146 mg/kg. Detected concentrations of cadmium ranged from 1 mg/kg to 390 mg/kg, with an average detected concentration of 51 mg/kg.

Concentrations of thirty-seven semi-volatile organic compounds (SVOCs) were detected in one or more of the collected samples. Polycyclic aromatic hydrocarbons (PAHs) were the most frequently detected SVOCs and include: 2-methylnaphthalene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(g,h,i)pyrene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene and pyrene. Of these PAHs, average detected concentrations ranged from 706 μg/kg for indeno(1,2,3-cd)pyrene (detected in 39 of 61 samples), to 9,270 μg/kg for 2-methylnaphthalene, which was detected in 35 of 61 samples. The PAHs most frequently exceeding criteria were benzo(a)pyrene, benzo(a)anthracene, and benzo(b)fluoranthene. Concentrations of pesticides exceeded criteria in less than five percent of the samples and polychlorinated biphenyls (PCBs) exceeded criteria in approximately eleven percent of the samples. Concentrations of volatile organic compounds (VOCs) were detected sporadically throughout the Site, but none were detected above the criteria.

Main Plant Subsurface Soils - Subsurface soil samples were collected at specific depth intervals up to 45 feet below ground surface. Concentrations of 11 metals exceeded federal and State criteria in one or more of the samples. The frequency of exceedances in subsurface soil samples was significantly lower than that for the surface soil samples. While criteria exceedances were less frequent in subsurface soil samples than surface soil samples, their distribution across the Site was equally widespread.

The inorganics most frequently exceeding criteria were antimony (22 of 101 samples), arsenic (22 of 118 samples), and chromium (22 of 115 samples). Cadmium and lead, which were among the metals most frequently exceeding criteria in surface soil samples, were detected in subsurface soil samples at concentrations exceeding criteria in 13 of 114 samples and 16 of 112 samples, respectively. Detected concentrations of lead ranged from 0.93 mg/kg to 90,600 mg/kg, with an average detected concentration of 1,838 mg/kg. Detected concentrations of cadmium ranged from 0.57 mg/kg to 20 mg/kg, with an average detected concentration of 5 mg/kg. Detected concentrations of antimony ranged from 3 mg/kg to 36 mg/kg, with an average detected concentration of 10 mg/kg. Detected concentrations of arsenic ranged from 1 mg/kg to 80 mg/kg, with an average detected concentration of 16 mg/kg. Detected concentrations of chromium ranged from 2 mg/kg to 536 mg/kg, with an average detected concentration of 44 mg/kg.

Concentrations of twenty nine SVOCs were detected in one or more of the subsurface soil samples. Frequency of detection and average detected concentrations were significantly lower than those in surface soil samples. The most frequently detected SVOCs were benzo(a)anthracene (33 of 124 samples), benzo(b)fluoranthene (35 of 121 samples), benzo(a)pyrene (37 of 124 samples), chrysene (40 of 124 samples), fluoranthene (40 of 124 samples), phenanthrene (41 of 125 samples) and pyrene (45 of 125 samples). Of these most frequently detected SVOCs, concentrations of benzo(a)pyrene, benzo(a)anthracene, and benzo(b)fluoranthene exceeded criteria in one or more of the samples. There were sporadic detections of pesticides, PCBs and VOCs that were above the criteria.

Sediments

Sediments from the main channel and the back channel of the Delaware River, Crafts Creek, and Crafts Creek wetlands were sampled in 1989, 1996 and 1998. Samples were taken upriver, adjacent, and downriver of the Site, and analyzed for volatile organic compounds, semi-volatile organic compounds, pesticides, and metals. Sediment samples were taken due to the Site's historic discharges of contaminants from its seven discharge outfalls which carried storm water, cooling water, spent acid, acid rinse waters, oily wastewaters, and effluent from the wastewater treatment plant (post-1973) to the Delaware River and Crafts Creek. Exceedances of federal and State criteria for sediments noted throughout the Proposed Plan are shown on Figure 2 and based on the most stringent sediment criteria represented between Canadian Low Effects Level (LEL) and Canadian Severe Effects Level (SEL). In the absence of LEL and SEL values, U.S. Effects Range - Low (ER-L) and U.S. Effects Range - Medium (ER-M) values were used.

Main Channel of the Delaware River - The concentration ranges of individual PAHs and metals in the shipping channel, upriver, adjacent and downriver samples were similar to each other. PCBs were not detected in any sediment samples taken from the main channel of the Delaware River.

Back Channel of the Delaware River - The most significant metal contamination was detected in sediment samples SD25, SD27 and SD51. These samples were collected in the back channel immediately downriver of Outfalls #4 and #3. These samples exhibited the highest detected concentrations of virtually all of the inorganic contaminants, including antimony, arsenic, beryllium, chromium, cobalt, copper, iron, lead, manganese, nickel, silver, vanadium and zinc. In addition, concentrations for many of the metals detected in sediment samples SD25, SD26 and SD27 significantly increased with depth. Average concentrations for the samples taken on the surface and at depth at all three sampling locations are aluminum (10,030 mg/kg, 19,963 mg/kg), chromium (117 mg/kg, 236 mg/kg), copper (241 mg/kg, 730 mg/kg), iron (163,000 mg/kg, 346,000 mg/kg), lead (213 mg/kg, 883 mg/kg), manganese (1,410 mg/kg, 2,887 mg/kg), nickel (93 mg/kg, 193 mg/kg), potassium (1,318 mg/kg, 3,297 mg/kg), and vanadium (31.5 mg/kg, 69 mg/kg). The contaminant concentrations increase with depth, which would be consistent with historic discharge from the outfalls.

Elevated total PAH concentrations of 10,657 μg/kg and 7,358 μg/kg were found in samples taken immediately downriver of Outfalls #5 and #6, respectively. The highest individual PAH concentrations in these samples were fluoranthene (1,600 μg/kg and 1,100 μg/kg) and pyrene (1,500 μg/kg and 960 μg/kg). Total pesticide concentrations ranged from 50 μg/kg to 78 μg/kg. Relatively low levels of PCBs were detected in sediment samples taken from the back channel.

Crafts Creek - Similar to the Delaware River samples, all of the Crafts Creek sediment samples exceeded reference ranges for at least one metal. One or more of the sediment screening criteria were exceeded by Crafts Creek samples for arsenic, cadmium, chromium, copper, lead, manganese, mercury, nickel and zinc.

Sediment samples from Crafts Creek contained higher concentrations of PAHs than found in the Delaware River. The total PAH values ranged from 2,830 μg/kg to 13,400 μg/kg. The highest individual PAH concentrations were benzo(a)anthracene (1,100 μg/kg), benzo(b)fluoranthene (1,600 μg/kg), benzo(k)fluoranthene (1,400 μg/kg), fluoranthene (2,300 μg/kg), phenanthrene (1,400 μg/kg), and pyrene (2,000 μg/kg). No patterns of PAH sediment contamination are apparent for this portion of Crafts Creek. Low levels of PCBs were detected in sediment samples taken from Crafts Creek.

Groundwater

The data analysis for the groundwater samples collected using conventional methods (prior 1996) relies primarily on the dissolved inorganic results, because the total inorganic results may be biased high due to interference from suspended particles in the samples. Additionally, the dissolved inorganic data were used in the analysis of the 1996-1997 HydroPunch screening results because of the nature of the sampling increased the suspension of particles in the sample. Analysis of groundwater sample results collected using low-flow methodology (after 1996) relies on the total inorganic results. It is believed that the low-flow sampling data is more representative of the true groundwater quality and conditions at the Site. Exceedances of federal and State standards noted for groundwater concentrations throughout the Proposed Plan are shown on Figure 2 and based on the most stringent groundwater criteria represented between NJ Class IIA

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Groundwater Quality Criteria (GWQC) and Federal Maximum Contaminant Levels (MCLs).

Analysis and correlation of sampling data collected from 1990 through 1998 indicate that there are sporadic exceedences of inorganics in a small number of wells. The areas of sporadic contamination are generally found in the Slag Area, landfill area, and near the wastewater treatment plant/Building 10. There are sporadic exceedences located in the southeastern portion of the Site. The results show that the following metals exceeding the most stringent standards are antimony, arsenic, beryllium, cadmium, copper, lead, nickel, selenium, silver and zinc. Elevated levels of aluminum, iron, and manganese were also present; these metals are know to be widespread and naturally occurring, however, they were also part of the site manufacturing process. VOC and SVOC compounds were detected at low levels and a lower frequency than metals in the upper aquifer. There were no exceedences of VOC and SVOC compounds in the lower aquifer. The results of the inorganic compounds are discussed below.

<u>Upper Aquifer Inorganic Exceedences</u> - Most notable are the following results exceeding standards found in monitoring wells (MW) and hydropunch (HP) samples in the above-mentioned areas:

- Antimony was detected at concentrations of 37.1 μg/L in MW29 in the Slag Area, 38.5 μg/L in MW06 in the landfill area, 35.8 μg/L in MW16 located in the southeastern portion of the Site, and 37 μg/L in MW13 located in the southeastern portion of the Site. The GWQC for antimony is 5 μg/L.

- Arsenic was detected at concentrations of 8.7 μg/L in MW24S in the wastewater treatment plant area, 8.1 μg/L and 10.6 μg/L in MW37 in the Slag Area, and 14.6 μg/L in MW 38 in the Slag Area. The GWQC for arsenic is 8 μg/L.

- Copper was detected at concentrations of 4,050 μg/L and 5,650 μg/L in MW21 in the landfill area, and 1,960 μg/L in HP21 near Building 13. The GWQC for copper is 1,000 μg/L.

- Lead was detected at concentrations of 13.2 μg/L in MW14 located on the southern portion of the Site, 36.1 μg/L and 54.5 μg/L in MW37 in the Slag Area, 66.8 μg/L in MW42 in the Slag Area, 17.9 μg/L in HP20 located in Building 10, 29.6 μg/L in HP 21 near Building 13, and 10 μg/L in HP22 near Building 88. The GWQC for lead is 10 μg/L.

<u>Lower Aquifer Inorganic Exceedences</u> - Most notable are the following results exceeding standards in the above-mentioned areas:

- Arsenic was detected at a concentration of 95.3 μg/L in MW17D located on the southeastern portion of the Site.

- Beryllium was detected at concentrations of 16.2 μg/L, 22 μg/L and 24.9 μg/L in MW24D in the wastewater treatment plant area. The standard for beryllium is 1 μg/L.

- Lead was detected at a concentration of 37 μg/L in MW08D near Outfall No. 6.

- Zinc was detected at concentrations of 18,400 μg/L in MW20D in the landfill area, 14,400 μg/L and 18,200 μg/L in MW24D in the wastewater treatment area, and 18,800 μg/L and 20,700 μg/L in MW32D near Building 10. The standard for zinc is 5,000 μg/L.

<u>Groundwater Model Results</u>

A groundwater model was developed to simulate the current metals contamination in the groundwater and predict the metals concentrations in the future under natural attenuation and other various remediation scenarios. The modeling included (1) development of a calibrated steady-state groundwater flow model, (2) development of a transient contaminant transport model, and (3) simulation of various groundwater remediation scenarios using the transport model. The details of the modeling system and assumptions are provided in Appendix D of the Feasibility Study. The groundwater contamination included three exceedences of lead and one exceedence of arsenic in the upper aquifer, and three separate exceedences of lead, arsenic, and beryllium in the lower aquifer. The highest concentrations from data in the RI report was utilized in the modeling. The continuing source of metals contamination in the groundwater is the site-wide soils and slag found above and below the water table. The following scenarios were modeled.

Base Case Transport Model (No Source Removal and Natural Attenuation) - The base case transport model assumes that there is a continuing source of metals contamination and the source materials have not been removed. The modeling results indicate that with

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constant mass loading of arsenic, beryllium and lead for both 50 years and 100 years, the concentrations increase with time but the extent of contamination does not expand.

No Source Removal and Pump and Treat - This remediation scenario assumes that there is a continuing source of metals contamination (source materials have not been removed) and that a pump and treat system is installed to capture the lead, arsenic and beryllium contamination in the upper and lower aquifers. The modeling results indicate that after 50 years of pumping with no source removal, the concentration increase in a manner similar to the base case.

Source Removal and Natural Attenuation - This remediation scenario assumes that the sources of groundwater contamination are removed and the remaining metals are naturally remediated as a result of the flushing action of the groundwater flow system. The modeling results indicate that it will take thousands of years for the aquifer to reach the groundwater quality criteria which have been identified as cleanup targets for lead using this scenario.

Source Removal and Pump and Treat - This remediation scenario assumes that the sources of groundwater contamination are removed and that a pump and treat system is installed to capture the lead, arsenic and beryllium contamination in the upper and lower aquifers. The modeling results indicate there is minimal change in the lead concentrations after 50 years of pump and treat. Calculations were performed that indicate that it will take thousands of years for the lower aquifer to reach groundwater quality criteria which have been identified as cleanup targets under this scenario.

Hydraulic Containment and Cutoff Wall - This remediation scenario includes the installation of a linear cutoff wall in conjunction with an extraction well system. For the modeling effort, the cutoff wall was placed along the Delaware River with the extraction wells system inside the wall to capture groundwater that moves downgradient towards the wall. The modeling results indicate that hydraulic containment is achievable, however groundwater quality criteria which have been identified as cleanup targets would not be reached under this scenario.

Surface Water

Surface water from the main channel and the back channel of the Delaware River and Crafts Creek were sampled in 1989, 1996 and 1998. Samples were taken upriver, adjacent, and downriver of the Site, and analyzed for volatile organic compounds, semi-volatile organic compounds, pesticides, and metals. Surface water samples were taken due to the Site's historic discharges of contaminants from its seven discharge outfalls to the Delaware River and Crafts Creek. The 1998 sampling effort included a series of ground water, ground water seep and surface water samples that were collected simultaneously during different stages of the tidal cycle. A total of 108 surface water samples were collected from the Delaware River along four transects oriented perpendicular to the northern shoreline of the Site, as well as from two transects located upstream from the Site. Ground water samples were collected from selected wells (MW33, MW31, MW30 and MW8S) along the northern periphery of the Site and from four ground water seep locations along the bank of the Delaware River to better integrate near-river ground water concentrations with the surface water effects (Figure 2). Exceedances of federal and State criteria for surface water noted throughout the Proposed Plan are shown on Figure 2 and based on the most stringent surface water criteria represented between New Jersey Surface Water Quality Standards, National Ambient Water Quality standards and Delaware River Basin Compact (DRBC) standards.

<u>Main Channel of the Delaware River</u> - Most main channel surface water samples exhibited concentrations of aluminum (maximum concentration 358 µg/L at SW-10), copper (maximum concentration 11 µg/L at SW-04A), iron (maximum concentration 637 µg/L at SW-10), lead (maximum concentration 3.6 µg/L at SW-04) and manganese (maximum concentration 99 µg/L at SW-13) in excess of the most stringent surface water criteria. The concentrations of these metals in surface water samples located adjacent to the Site were generally lower than the 1998 background levels at 5 to 15 feet out into the channel at low tide. Dissolved zinc was an exception, which exceeded the background level at all of the three transect sampling locations in the main channel adjacent to the Site. The surface water impacts appear to be related primarily to colloidal and/or suspended sediments/particulate matter in the samples (SP01 through SP03 and transects TR01 through TR03). Interpretation of the data indicates that the surface water contamination appears to decrease in concentration outward from the Site, in a thin band parallel to the riverbank. This decrease in metals concentrations outward from the Site may be related to an increase in proportional mixing and dilution of site-related discharge waters with surface water outward into the channel. The 1998 surface water data appears to indicate limited

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impact to surface water in the main channel from site discharges.

Back Channel of the Delaware River - Numerous detections of aluminum, copper, and manganese were similar to those in the samples collected in the main channel. There were occasional detections of iron (maximum concentration 4,470 μg/L at SW-27), lead (maximum concentration 11.4 μg/L at SW-33) and silver (maximum concentration 4.7 μg/L at SW-32) in the back channel samples were found to exceed the most stringent surface water criteria. Elevated iron, lead and silver concentrations detected near Outfalls #1 and #2 and near the mouth of Crafts Creeks may be related to the discharges of process waters. Again, the surface water impacts appear to be related primarily to colloidal and/or suspended sediments/particulate matter in the samples. The data also suggests that dissolved copper and zinc are present in groundwater discharges near the mouth of the back channel. Similar to the total concentrations, the highest concentrations of dissolved metal appear to be limited to the shallow back channel area adjacent to the riverbank. This dissolved metals contamination would contribute directly to the water quality in the main channel.

Crafts Creek - Elevated total iron and lead concentrations detected near Outfalls #1 and #2 and near the mouth of Crafts Creeks may be related to the discharges of process waters. Detected concentrations of iron ranged from 444 μg/L to 16,700 μg/L, with an average detected concentration of 6,087 μg/L and lead ranged from 1.2 μg/L to 21 μg/L, with an average detected concentration of 6.2 μg/L. The surface water contamination was detected primarily in the total fraction of the sample, indicating that contamination is most likely the result of impacts from suspended sediment/particles in the sample. A potential source of the metals contamination in Crafts Creek is particulate matter from historic process water discharges at the RSC site, which could have been deposited and resuspended by tidal currents moving in and out of the basin. However, other potential sources are present in the upstream portion of the Crafts Creek tidal basin, which could have contributed to the metals contamination.

Groundwater/Surface Water Interaction

A comparison of the concentrations of metals in the three ground water seep sampling rounds, and a comparison of the concentrations and individual metals detected in the paired monitoring wells and ground water seep samples indicates that during low tide the groundwater discharges to the surface water. The generally decreasing concentration gradients of total metals in surface water samples outward from the Site and the proximity of the contamination to known source areas of these metals, indicates that the Site is a contributor of this contamination. With the exception of dissolved copper and zinc, the total metal exceedances appear to be associated with colloidal and/or particulate matter in the river channel at the time of sampling. A potential source of the sediment contamination are dissolved metals in the ground water discharges which have adsorbed onto solid matter, or contaminated particles and debris in surface water runoff, debris in surface water runoff, and historic discharge-contaminated process waters from storm drain lines/outfall areas at the Site.

OU3 Slag Area Soils (Summary of Pre- and Post- 1991 ROD Investigations)

1991 Focused Feasibility Study

EPA conducted a field investigation consisting of two stages in 1988 and 1989 to determine the type and extent of contamination in the Slag Area. The analytical results are presented in their entirety in the Focused Feasibility Study (FFS) completed in June 1991 and are summarized below.

Sampling results indicate that inorganics are the primary contaminants of potential concern in the Slag Area soils. These include the following metals: antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, magnesium, manganese, mercury, nickel, selenium, silver, vanadium, and zinc. In addition, volatile and semi-volatile organic contaminants were detected in the slag material at low levels. Wide variations in the metals composition among sampling locations indicate that the slag is not chemically homogeneous. Elevated concentrations of all the above-mentioned metals occurred within the 0-2 ft and 2-4 ft depth intervals, and elevated concentrations of barium, chromium, copper, iron, lead, magnesium, manganese, nickel, silver, vanadium, and zinc occurred within the 4-6 ft, 6-10 ft and 10-14 ft depth intervals. Lead contamination is of particular concern at the Slag Area because it was detected at high concentrations in many samples. The concentration ranges for lead detected in surface and subsurface samples were 47.6 - 10,400 mg/kg and non-detected (ND) - 8,650 mg/kg, respectively.

EP Toxicity testing was performed on the slag samples to determine the leaching behavior of the slag and whether the slag material should be classified as a characteristic waste subject to the Resource Conservation and Recovery Act (RCRA) requirements. The EP Toxicity results showed elevated concentrations of lead in two adjacent samples. In February 1991, TCLP testing was performed on the slag material (TCLP testing is the analytical method currently used, which replaced EP Toxicity testing). The TCLP results detected concentrations below the TCLP regulatory levels. Variability in the test results was believed to be due to the chemical heterogeneous nature of the slag material. Based on the FFS data, the volume of slag material that was thought to leach contaminants into the groundwater, thus needing treatment, was estimated to be approximately 30,000 cubic yards (cy) at that time. This estimated volume of slag material was based on a limited number of samples analyzed for EP Toxicity and TCLP tests. It was therefore anticipated that additional surface and subsurface sampling to further delineate hot spot areas would be necessary during the remedial design.

1999 Predesign Investigation

In 1991, the U.S. Army Corps of Engineers (COE) was given the responsibility to design and implement the remedy selected for the Slag Area. A pre-design investigation to delineate hot spot areas and to further characterize the Slag Area was conducted in two stages. Stages 1 and 2 were performed in the fall of 1993 and 1994, respectively, and the results are presented in the Predesign Investigation Report (PIR) issued by the design contractor, URS Consultants, Inc., in May 1999.

The results of TCLP testing for metals during the Stage 1 investigation confirmed the presence of the hot spot previously identified in the 1991 FFS, and identified three new hot spot areas. Exceedances of TCLP limits were detected for lead and cadmium only. Lead concentrations exceeding the TCLP limit of 5 mg/L ranged from 5.9 mg/L to 1,080 mg/L. Cadmium concentrations exceeding the TCLP limit of 1 mg/L ranged from 14.1 mg/L to 23.5 mg/L. The results of TCLP testing during Stage 2 further refined the hot spot limits delineated in Stage 1. Approximately a third of the TCLP exceedances reported in the four hot spot areas were below the water table.

Based upon the new data generated during the pre-design investigation, the volume of slag material estimated in the 34 acres is approximately 710,000 cy, with 210,000 cy now exceeding the TCLP criteria. The spatial area associated with the hot spot zones is approximately eight acres. Therefore, based on the pre-design investigation data, the volume of slag material that would require treatment under the original ROD is now estimated to be approximately 210,000 cy.

Significantly, the analytical results from the hot spot delineation, groundwater, surface water and sediment investigations indicate that the metal contamination present in the slag material and groundwater does not show a significant impact on the biota in the sediments and the quality of the surface water. Samples indicating groundwater contamination are primarily a result of sampling less-mobile naturally occurring particulates with adsorbed metals contamination, and to a much lesser degree more mobile, dissolved metals contamination resulting from leaching. For these reasons, it was decided that for the Site, the Toxicity Characteristic Leaching Procedure (TCLP) used as a basis for the 1991 ROD, was not a good indicator of hot spots in the Slag Area and instead, the aforementioned sediment, surface water, and groundwater sampling would be more relevant. The conclusions from these studies were incorporated into the RI/FS, and support the rationale for amending the OU3 ROD.

WHAT IS A "PRINCIPAL THREAT"?

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP Section 300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund site. A source material is material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to groundwater, surface water or air, or acts as a source for direct exposure. Contaminated groundwater generally is not considered to be a source material; however, Non-Aqueous Phase Liquids (NAPLs) in groundwater may be viewed as source material. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of the alternatives using the nine remedy selection criteria This analysis provides a basis for making a statutory finding that the remedy employs treatment as a principal element.

The principal threats posed by the Site consist mainly of wastes products and materials from the steel manufacturing process that have contaminated the soils, sediments and groundwater. These sources of contamination, also referred to as areas of concern (AOCs), will be remediated as part of the OU4 building cleanup.

SCOPE AND ROLE OF THE ACTION

As previously discussed, EPA is addressing the remediation of the Roebling Steel Site in a phased approach. This ROD, the fourth and final ROD planned for the Site, focuses on the remediation of the soils, sediments and groundwater, and recommends changes to the selected remedy for the Slag Area identified in the 1991 ROD. It constitutes the final action for the Site.

SUMMARY OF SITE RISKS

Based upon the results of the RI, a baseline risk assessment was conducted to estimate the risks associated with current and future site conditions. The baseline risk assessment estimates the human health and ecological risk which could result from the contamination at the Site if no remedial action were taken.

The baseline risk assessment evaluated the health effects which could result from exposure to contamination from surface and subsurface soils (incidental ingestion, dermal contact, and inhalation of suspended soil particulates), groundwater (ingestion, dermal contact, and inhalation), surface water (incidental ingestion, dermal contact and inhalation), sediments (incidental ingestion and dermal contact) and fish from Crafts Creek (ingestion). The risk assessment evaluated the exposure pathways believed to be associated with the greatest potential exposures. An identified pathway does not imply that exposures are actually occurring, but only that the potential exists for the pathway to be completed.

The risk assessment considered the Site's current land use as an abandoned industrial facility, and the projected future land uses as mixed commercial and residential use. These assumptions are solely for risk assessment purposes, and are not related to any reuse plan showing potential land use as recreational and commercial. Current receptors include occasional trespassers and off-site residents and future receptors include residents, commercial site workers and construction workers. Exposure assumptions were made for both average case and reasonable maximum case exposure scenarios.

Quantitative Human Health Risks

The baseline risk assessment identifies contaminants of potential concern, evaluates exposures pathways, and quantifies the degree of risk. The contaminants that are likely to pose the most significant risks to human health and the environment were identified, and are evaluated

WHAT IS RISK AND HOW IS IT CALCULATED?

A Superfund baseline human health risk assessment is an analysis of the potential adverse health effects caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these under current- and future-land uses. A four-step process is utilized for assessing site-related human health risks for reasonable maximum exposure scenarios.

Hazard Identification: In this step, the contaminants of concern at the site in various media (i.e., soil, groundwater, surface water, and air) are identified based on such factors as toxicity, frequency of occurrence, and fate and transport of the contaminants in the environment, concentrations of the contaminants in specific media, mobility, persistence, and bioaccumulation.

Exposure Assessment: In this step, the different exposure pathways through which people might be exposed to the contaminants identified in the previous step are evaluated. Examples of exposure pathways include incidental ingestion of and dermal contact with contaminated soil. Factors relating to the exposure assessment include, but are not limited to, the concentrations that people might be exposed to and the potential frequency and duration of exposure. Using these factors, a "reasonable maximum exposure" scenario, which portrays the highest level of human exposure that could reasonably be expected to occur, is calculated.

Toxicity Assessment: In this step, the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of adverse effects (response) are determined. Potential health effects are chemical-specific and may include the risk of developing cancer over a lifetime or other non-cancer health effects, such as changes in the normal functions of organs within the body (e.g., changes in the effectiveness of the immune system). Some chemicals are capable of causing both cancer and non-cancer health effects.

Risk Characterization: This step summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site risks. Exposures are evaluated based on the potential risk of developing cancer and the potential for non-cancer health hazards. The likelihood of an individual developing cancer is expressed as a probability. For example, a 10^{-4} cancer risk means a "one-in-ten-thousand excess cancer risk"; or one additional cancer may be seen in a population of 10,000 people as a result of exposure to site contaminants under the conditions explained in the Exposure Assessment. Current Superfund guidelines for acceptable exposures are an individual lifetime excess cancer risk in the range of 10^{-4} to 10^{-6} (corresponding to a one-in-ten-thousand to a one-in-a-million excess cancer risk). For non-cancer health effects, a "hazard index" (HI) is calculated. An HI represents the sum of the individual exposure levels compared to their corresponding reference doses. The key concept for a non-cancer HI is that a "threshold level" (measured as an HI of less than 1) exists below which non-cancer health effects are in detail. The compounds which were chosen as the contaminants of potential concern (COPCs) for the surface and subsurface soil are provided below:

WHAT ARE THE "CONTAMINANTS OF CONCERN"?

EPA and NJDEP identified the following contaminants that pose the greatest potential risk to human health in the site soils. The compounds which were chosen as the contaminants of potential concern for the surface and subsurface soil include semi-volatiles (carcinogenic and non-carcinogenic PAHs), pesticides and PCBs, and metals (antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, manganese, mercury, nickel, silver, thallium, vanadium, and zinc).

Based on the reasonable maximum exposure (RME) risk estimates, current off-site child residents, future on-site child/adult residents, and future construction workers may be exposed to COPCs in the surface soil, subsurface soil and groundwater. Based on the average case or cental tendency (CT) risk estimates, future on-site child residents may be exposed to COPCs in the surface soil, subsurface soil and groundwater. The risk calculations indicate that the ingestion and dermal contact pathways are the major contributors to the reasonable maximum exposure risk values. These values can be attributed to the contaminant concentrations of mainly antimony, arsenic and manganese. The carcinogenic risk values which marginally exceeded the target carcinogenic risk range (i.e., 10^{-4}-10^{-6}) and non-carcinogenic HI values that exceeded the benchmark HI criterion value of 1.0 are listed below. Additionally, under the reasonable maximum exposure scenarios, calculated total HI values are greater than the benchmark of one for both adults (total HI of 3.5) and children (total HI of 1.2) consuming fish from Crafts Creek, which can be attributed to copper for adults and mercury for both adults and children.

RISK ESTIMATES FOR SOIL

RME Risk Estimates

	Non-Carcinogenic Risk	
Current Off-Site Child Resident	1.6	manganese
Future On-Site Child Resident	15.3	antimony, arsenic, manganese
Future On-Site Adult Resident	1.2	antimony
Future Construction Worker	1.8	antimony

CT Risk Estimates

	Non-Carcinogenic Risk	
Future On-Site Child Resident	2.9	antimony

RISK ESTIMATES FOR GROUNDWATER

RME Risk Estimates

	Carcinogenic Risk	
Future On-Site Child Resident	1.3×10^{-4}	TCE, arsenic
Future On-Site Adult Resident	2.4×10^{-4}	TCE, arsenic

	Non-Carcinogenic Risk	
Future On-Site Child Resident	3.5	arsenic, manganese

CT Risk Estimates

	Non-Carcinogenic Risk	
Future On-Site Child Resident	1.4	arsenic

RISK ESTIMATES FOR FISH INGESTION

RME Risk Estimates

	Non-Carcinogenic Risk	
Current and Future Child Resident	1.2	mercury
Current and Future Adult Resident	3.5	copper mercury

The results of the quantitative baseline risk assessment indicate that all exposures to receptors associated with the Delaware River and Crafts Creek sediments and surface water under current and future uses are acceptable, both in terms of cancer and non-cancer risks.

Qualitative Human Health Risks

A qualitative assessment was performed for lead in addition to the quantitative risk assessment described below. Lead was detected in soils, but was not be quantitatively addressed in the risk assessment, as there is no EPA established toxicity value for lead. Therefore, non-carcinogenic risk values calculated in the quantitative risk assessment discussed below were underestimated due to this exclusion. A health-based commercial screening level for lead in soil was calculated using the Adult Lead Exposure Model developed by EPA.

The model is designed to assess exposure to adult workers; however the model is protective of the most vulnerable potential receptor under this scenario, the fetus of a pregnant worker. The upper bound risk-based remediation goal is 1753 mg/kg and the lower bound risk-based remediation goal is 749 mg/kg for lead for future site workers. In addition, an EPA directive has recommended a health-based residential screening level for lead in soil of 400 mg/kg. This screening level was calculated with the Integrated Exposure Uptake Biokinetic Model (IEUBK) for children, which takes into account the multimedia nature of lead exposures in a child's environment.

The average and maximum lead concentrations detected in the surface soil samples (0-0.2 feet) are 7,161 mg/kg and 69,000 mg/kg. The average and maximum lead concentrations detected in the subsurface soil samples are 1,838 mg/kg and 90,600 mg/kg. These concentrations are significantly higher than EPA's health-based levels. Although a quantitative estimation of carcinogenic and non-carcinogenic risks attributable to lead could not be made, it is evident from the extremely high concentrations detected, that the soils pose an unacceptable risk.

Ecological Risks

A four-step process is utilized for assessing site-related ecological risks for a reasonable maximum exposure scenario: *Problem Formulation* - a qualitative evaluation of contaminant release, migration, and fate; identification of contaminants of concern, receptors, exposure pathways, and known ecological effects of the contaminants; and selection of endpoints for further study. *Exposure Assessment* - a quantitative evaluation of contaminant release, migration, and fate; characterization of exposure pathways and receptors; and measurement or estimation of exposure point concentrations. *Ecological Effects Assessment* - literature reviews, field studies, and toxicity tests, linking contaminant concentrations to effects on ecological receptors. *Risk Characterization* - measurement or estimation of both current and future adverse effects.

The ecological risk assessment began with evaluating the contaminants associated with the Site in conjunction with the site-specific biological species/habitat information. The primary areas of concern are the Delaware River and Crafts Creek, which support a diverse aquatic and wetlands community, including an important recreational fishery in the Delaware River. The river also represents a significant habitat for the endangered shortnose sturgeon *(Acipenser brevirostrum)*, which is known to occur in this section of the river. Additionally, a pair of federally threatened and state endangered bald eagles *(Haliaeetus leucocephalus)* have established a nest within 0.75 miles of the Site. Terrestrial ecological receptors are limited due to the lack of appreciable terrestrial habitat and the industrial setting of the Site.

Results of the ecological risk assessment determined that PAHs, arsenic, chromium, copper, iron, lead, manganese, and nickel in the sediments of the back channel and Crafts Creek are impacting or pose risks to ecological receptors in these environments. Contaminant inputs to the river include the historical deposition of slag into the river, site surface runoff, wind-blown dust particulates into the river, groundwater discharge, and discharge from Crafts Creek. Input into the creek include site surface runoff, groundwater discharge, and tidal influxes. Delaware River and Crafts Creek biota contaminant exposure pathways include direct uptake (ingestion and absorption) by planktonic and benthic organisms from surface water, aquatic and wetland vegetation from sediments, and indirect uptake by consumers via food chain pathways, such as the blue heron.

The results of the ecological risk assessment indicate that the sediments in the following areas of the Delaware River and Crafts Creek pose a risk to the ecological receptors. Two areas of the back channel of the Delaware River adjacent to discharge outfalls and three areas in Crafts Creek showed significant reductions in survival of benthic organisms. The observed impacts in the benthic community included a communal shift to taxa known to tolerate sediments contaminated with metal wastes. These areas also exceeded the lead threshold levels for the blue heron. The primary exposure pathway was identified as the incidental ingestion of sediments.

Actual or threatened releases of hazardous substances from this Site, if not addressed by the preferred alternative or one of the other active measures considered, may present a current or potential threat to public health, welfare, or the environment.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are specific goals to protect human health and the environment. These objectives are based on available information and standards such as applicable or relevant and appropriate requirements (ARARs) and appropriate criteria, advisories, and guidance (i.e., To Be Considered (TBCs) materials), and calculated risk-based levels established in the risk assessment. Compliance with ARARs/TBCs may be "waived" if site specific circumstances justify such a "waiver". Remedial action objectives developed for the soil (including the 34-acre Slag Area), sediments and groundwater, considers all identified site concerns and contaminant pathways, and are listed below:

- Prevention of human exposure to contaminated site-wide soils and slag material based on current and anticipated future uses.

- Reduce risk to ecological receptors from exposure to contaminated sediments to acceptable levels.

- Restore the groundwater to drinking water standards within a reasonable time frame and reduce further contamination of groundwater. This remedial objective was intended, however EPA has determined that restoration of groundwater is technically impracticable for this Site.

- Minimize contaminant migration from the soils, slag material and sediments to the groundwater and surface waters to levels that ensure the beneficial reuse of these resources.

SUMMARY OF REMEDIAL ALTERNATIVES

CERCLA requires that each selected site remedy be protective of human health and the environment, be cost effective, comply with other statutory laws, and utilize permanent solutions and alternative treatment technologies and resource recovery alternatives to the maximum extent practicable. In addition, the statute includes a preference for the use of treatment as a principal element for the reduction of toxicity, mobility, or volume of the hazardous substances. The "construction time" for each alternative reflects only the time required to construct or implement the remedy and does not include the time required to design the remedy. It generally takes 1-2 years for planning, design and procurement prior to subsequent construction of the remedial alternative. The FS report evaluates in detail four remedial alternatives for contaminated soils, five remedial alternatives for contaminated sediments, and three remedial alternatives for contaminated groundwater. The Slag Area is also included within the soil alternatives; and, the updated remedial alternative for the Slag Area (SA) is evaluated in the Proposed Plan in conjunction with the soil alternatives. As discussed previously, the analytical results from the hot spot delineation, groundwater, surface water and sediment investigations indicate that the metal contamination present in the slag material and groundwater does not show a significant impact on the biota in the sediments and the quality of the surface water. Samples indicating groundwater contamination are primarily a result of sampling less-mobile naturally occurring particulates with adsorbed metals contamination, and to a much lesser degree more mobile, dissolved metals contamination resulting from leaching. For these reasons, it was decided that for the Site, the Toxicity Characteristic Leaching Procedure (TCLP) used as a basis for the 1991 ROD, was not a good indicator of hot spots in the Slag Area and instead, the aforementioned sediment, surface water, and groundwater sampling would be more relevant. Further, a brief description of the existing remedy for the Slag Area specified in the 1991 ROD is provided below.

EXISTING SELECTED REMEDY FOR OU3 (SLAG AREA) SPECIFIED IN THE 1991 ROD - Treatment of Hot Spots, and Soil Cap with Stormwater Management System and Shoreline Protection

Volume of slag requiring treatment:	30,000 cy
Estimated Capital Cost:	$6,759,000
Estimated Annual O&M Cost:	$344,000
Estimated Present Worth:	$12,106,000
Estimated Construction Time:	12 months

As part of the 1991 ROD, EPA selected a remedy for the 34-acre Slag Area (OU3). The existing remedy involves treating hot spots, defined as highly contaminated slag material that fails a TCLP test, prior to covering the entire 34-acre Slag Area with a soil cap and vegetation. The cap would consist of two feet of top soil and vegetation extending to the side slopes. The grading contours of the soil cap would support a stormwater management system that collected and conveyed runoff to the Delaware River while providing improvement in surface water quality. A small portion of the Slag Area that is located in the 100-year flood plain would be graded to above the flood plain elevations. A riprap stone revetment would be placed from the edge of the soil cap down into the surface water to mitigate potential erosion of the shoreline. The slag material in those areas designated as hot spots would be excavated and treated on-site using a mobile treatment unit and placed under the cap. Leachability would be determined by testing the slag material using the TCLP analysis. Stabilization of the slag material would physically or chemically bind contaminants of concern within an insoluble matrix, significantly reducing their potential to leach.

SUMMARY OF REMEDIAL ALTERNATIVES		
Medium	**RI/FS Designation**	**Description**
Slag Area Soils	1991 Selected Remedy (OU3)	Treatment of Hot Spots, and Soil Cap with Stormwater Management System and Shoreline Protection
	Updated Selected Remedy - SA	Based on Updated Predesign Investigation Information on Volume and Cost (Treatment of Hot Spots, and Soil Cap with Stormwater Management System and Shoreline Protection)
Site-Wide Soils (including the Slag Area)	SL1	No Action
	SL2	Limited Action
	SL3	Containment
		Option (a) - Soil/Asphalt
		Option (b) - Soil Only
	SL4	Source Removal/Off-Site Disposal
Sediments	SD1	No Action
	SD2	Limited Action
	SD3	Containment
	SD4	Dredging/Dewatering/Off-Site Disposal
	SD5	Dredging/Dewatering/On-Site Disposal
Groundwater	GW1	No Action
	GW2	Limited Action
	GW3	Containment
	GW4	Restoration (Extraction Wells for Pump-and-Treat)
		Option (a) - Source Removal
		Option (b) - No Source Removal

Dewatering of slag material found below the water table would be necessary during its excavation. The extracted water would be collected, treated, and disposed in accordance with federal and State requirements. Since the existing remedy would result in treated material remaining on-site, a long-term groundwater and surface water monitoring program, periodic site inspections, and a review every five years would be required to determine the effectiveness of this remedy. Institutional controls would be implemented to restrict future excavations through the soil cap, especially in those areas that were stabilized. Future land uses would be limited by zoning or deed restrictions, which would be specified in the real estate transactions of the property.

REMEDIAL ALTERNATIVE SA FOR OU3 (SLAG AREA) BASED ON UPDATED PREDESIGN INVESTIGATION INFORMATION ON VOLUME & COST - Treatment of Hot Spots, and Soil Cap with Stormwater Management System and Shoreline Protection

Volume of slag requiring treatment:	210,000 cy
Estimated Capital Cost:	$60,855,000
Estimated Annual O&M Cost:	$344,000
Estimated Present Worth:	$66,146,000
Estimated Construction Time:	30 months

The existing remedy for the Slag Area documented in the 1991 ROD is being re-evaluated to incorporate new information collected during the pre-design investigation conducted after the 1991 ROD and noted above. The major components of the existing remedy for the Slag Area remain the same as noted above, but the volume of hot spot material requiring treatment has significantly increased. The 1991 ROD estimate of slag material requiring treatment was increased from 30,000 cy to 210,000 cy for this alternative, thereby increasing the estimated capital costs from $6,759,000 (1991 ROD estimate) to $60,854,000 (1997 pre-design investigation cost estimate).

REMEDIAL ALTERNATIVES FOR OU5 (SOILS (INCLUDING THE SLAG AREA), SEDIMENT, & GROUNDWATER)

SOIL ALTERNATIVES

Alternative SL1: No Action

Estimated Capital Cost:	$0
Estimated Annual O&M Cost:	$0
Estimated Present Worth:	$54,000
Estimated Construction Time:	None

CERCLA and the NCP require the evaluation of No Action as a baseline to which other alternatives are compared. No active remediation or containment of any contamination associated with the soils would be performed. However, this alternative would include five-year reviews of site data as required by CERCLA for sites where contamination remains after initiation of the remedial action.

Alternative SL2: Limited Action

Estimated Capital Cost:	$1,731,000
Estimated Annual O&M Cost:	$318,000
Estimated Present Worth:	$5,869,000
Estimated Construction Time:	6-12 months

This alternative would consist of a long-term monitoring program, installation of site security measures (i.e., repair fencing and maintaining security guards) and institutional controls (i.e., restrictions on land use in the form of a NJDEP Deed Notice). Periodic site inspections would be implemented to assess the potential migration of contaminants. CERCLA requires that if a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, EPA must review the action no less often than every five years after initiation of the action. Because contamination would be left in place under this alternative, a review of the remedy every five years would be required.

Alternative SL3: Containment

Estimated Capital Cost:	$20,092,000 (Option a) $16,839,000 (Option b)
Estimated Annual O&M Cost:	$212,000 (Option a) $178,000 (Option b)
Estimated Present Worth:	$24,422,000 (Option a) $20,479,000 (Option b)
Estimated Construction Time:	1-2 years (Options a or b)

This alternative includes containment of site-wide contaminated soils, including the Slag Area, by capping. Two distinct capping options are considered based on the physical characteristics of different portions of the Site, and the current and potential future uses of each portion, option (a) soil/asphalt, and option (b) soil only. These options are presented to demonstrate the range of possibilities, recognizing that the final capping plan may fall somewhere in between these two options. Option (a) would be appropriate for a mixed recreational and commercial use scenario in which some of the buildings on the Site would remain, and the asphalt capping would minimize grade changes and maintain access to buildings. Areas on the perimeter of the Site, where grade changes would be less disruptive to site operations, would be capped using approximately two feet of soil. Option (b) would be appropriate for a recreational use scenario in the event that all buildings on the Site were demolished. Additional investigations, remediation measures, and institutional controls would be needed for residential use scenarios.

For Option (a) the total area to be capped with soil cap in the main plant area is 414,000 square yards (86 acres) and would consist of approximately 1.5 feet of clean fill and six inches of top soil to support vegetation. Asphalt cap areas would cover approximately 178,000 square yards (37 acres) and would consist of approximately six inches of gravel subbase and four to six inches of asphalt. For Option (b), the total area to be capped with soil cap is 592,000 square yards (123 acres). The total area to be capped with soil cap in the Slag Area is 165,000 square yards (34 acres), for both Options (a) and (b). The total volumes of clean fill and topsoil for the main plant capping are 207,000 cy and 69,000 cy, respectively, for Option (a), and 296,000 cy and 99,000 cy, respectively, for Option (b). The total volumes of clean fill and top soil for the Slag Area capping are 83,000 cy and 28,000 cy for both Options (a) and (b).

Compaction, intermediate and final grading would be performed as required by the cap designs. Any soil AOCs that may be identified during implementation of OU4 would be properly delineated and remediated prior to capping activities. A permeable liner would be placed beneath the cap to act as a visible marker to minimize direct contact should the overlying cap be breached. Soil cap areas would be vegetated to prevent erosion of the soils. The areas to be capped are generally not steep slopes except for the Slag Area. Stormwater management and erosion controls would be determined during the design phase for the main plant area and are already planned for the Slag Area. This alternative would require long-term maintenance and monitoring of the capped areas. Institutional controls would be implemented to restrict future excavations through the soil cap and future land uses would be limited by zoning or NJDEP Deed Notice. CERCLA requires that if a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, EPA must review the action no less often than every five years after initiation of the action. Because contamination would be left in place under this alternative, a review of the remedy every five years would be required.

Alternative SL4: Source Removal/Off-Site Disposal

Estimated Capital Cost:	$649,931,000
Estimated Annual O&M Cost:	$0
Estimated Present Worth:	$649,931,000
Estimated Construction Time:	2-3 years

This alternative consists of the excavation of all contaminated soils and slag material above cleanup levels, off-site disposal and site restoration. Contaminated soils and slag material would be excavated using conventional construction techniques. It is estimated that the total volume of soil to be excavated in the main plant area is 860,000 cy. The total volume of slag to be excavated is approximately 710,000 cy. The volume estimate for the main plant was based on an excavation depth of four to ten feet, where the volume estimate for the Slag Area was based on the entire volume due to limited analytical data. It is assumed that 30 percent of excavated soil and slag material would be characteristic hazardous waste based on the exceedence of the Toxic Compound Leaching Procedure (TCLP) limits for inorganics (i.e., lead and cadmium). This hazardous waste would require treatment to render it non-hazardous prior to disposal, because of RCRA Land Disposal Restrictions (LDRs).

Site restoration would consist of backfilling all excavations with clean fill to within six inches of original grade, placement of approximately six inches of top soil and revegetation to stabilize the soils. The areas to be backfilled are generally not steep slopes except for the Slag Area. Stormwater management and erosion controls would be determined during the design phase for both the main plant area and the Slag Area.

SEDIMENT ALTERNATIVES

Alternative SD1: No Action

Estimated Capital Cost:	$0
Estimated Annual O&M Cost:	$0
Estimated Present Worth:	$54,000
Estimated Construction Time:	None

CERCLA and the NCP require the evaluation of No Action as a baseline to which other alternatives are compared. No active remediation or containment of any contamination associated with the sediments would be performed. However, this alternative would include five-year reviews of site data as required by CERCLA for sites where contamination remains after initiation of the remedial action.

Alternative SD2: Limited Action

Estimated Capital Cost:	$21,000
Estimated Annual O&M Cost:	$47,000
Estimated Present Worth:	$656,000
Estimated Construction Time:	6-12 months

This alternative would consist of a long-term sediment monitoring program, installation of site security measures (i.e., repair fencing and maintaining security guards) and restrictions on land use in the form of a Deed Notice. Periodic site inspections would be implemented to assess the potential migration of contaminants. A long-term sediment monitoring program would be developed to ensure that risks resulting from on-site contamination do not increase. CERCLA requires that if a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, EPA must review the action no less often than every five years after initiation of the action. Because contamination would be left in place under this alternative, a review of the remedy every five years would be required.

Alternative SD3: Containment

Estimated Capital Cost:	$4,218,000
Estimated Annual O&M Cost:	$62,000
Estimated Present Worth:	$5,144,000
Estimated Construction Time:	1 year

This alternative includes containment of contaminated sediments by capping. Contaminated sediments near the Site cover a total of approximately 87,000 square yards or

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18 acres, and are mostly in wetland areas that need to be maintained or restored to their original value and function after remediation. Further delineation of the impacted areas would be conducted during the design phase. In order to maintain the current grade, approximately 18 inches of existing sediments would be removed by dredging. This would allow placement of the cap without significantly changing existing elevations. The cap would consist of a minimum of six inches of compacted soil with a minimum one foot of a sandy loam soil and organic matter capable of supporting wetland vegetation. Capped areas would be vegetated to restore the wetlands. Appropriate measures would be implemented to control contaminant migration from sediments. Specific details for dredging and sediment erosion control would be developed during the design phase. The resulting excavated sediments with a total volume of approximately 43,500 cy would be disposed of off-site or on-site. This alternative would require long-term maintenance and monitoring of the capped areas. CERCLA requires that if a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, EPA must review the action no less often than every five years after initiation of the action. Because contamination would be left in place under this alternative, a review of the remedy every five years would be required.

Alternative SD4: Dredging/Dewatering/Off-Site Disposal

Estimated Capital Cost:	$19,279,000
Estimated Annual O&M Cost:	$0
Estimated Present Worth:	$19,279,000
Estimated Construction Time:	1-2 years

This alternative consists of dredging all contaminated sediments, dewatering the dredged sediments, off-site disposal, and site restoration. The area of sediments requiring excavation is the same as discussed in Alternative SD3. Further delineation of the impacted areas would be conducted during the design phase. The objective of the sediment remediation is to remove all loose silty materials down to the hard stream/river bottom in the contaminated area to remove the potential of exposure to ecological receptors. The actual depths of contaminated sediment may vary significantly. Using a depth of four feet, the total volume of sediments to be dredged is estimated at 116,000 cy. Dredge areas would be restored by placement of a sandy loam soil with organic matter and revegetated to establish wetlands whose function and value are at least equal to the existing wetlands. Appropriate measures would be implemented during dredging to control contaminant migration from sediments. Specific details for dredging and sediment erosion control would be developed during the design phase.

Dredged material would be managed based on the characterization after dredging. The dredged materials would be dewatered prior to being transported off-site for disposal at a non-hazardous landfill or other approved dredge spoil disposal location. Results from the RI report indicate that sediments to be dredged contain concentrations of constituents that exceed ecological benchmarks and pose a risk to ecological receptors, but are below the standards that would characterize the sediments as RCRA hazardous waste for disposal purposes. Water recovered from the dewatering operation would be treated and discharged appropriately in accordance with all applicable requirements.

Alternative SD5: Dredging/Dewatering/On-Site Disposal

Estimated Capital Cost:	$11,354,000
Estimated Annual O&M Cost:	$0
Estimated Present Worth:	$11,354,000
Estimated Construction Time:	1-2 years

Alternative SD5 incorporates the basic components of the SD4, in terms of dredging and dewatering, however this alternative proposes disposal of the sediments on-site. Based on limited data, it is assumed that the excavated sediments would be non-hazardous and therefore would not require treatment prior to on-site disposal. An estimated volume of 116,000 cy would be placed on-site. The design phase would consider the placement of this extra volume of material with respect to stormwater management, erosion control and flood plain elevations.

GROUNDWATER ALTERNATIVES

EPA plans to conduct a comprehensive pre-design investigation for groundwater, groundwater seeps, surface water, sediments and soil AOCs to provide a current and complete set of data and further assess groundwater metals impact to the river from both the Slag Area and site-wide soils. This investigation will serve to evaluate and confirm our current conclusions. If future monitoring indicates different conclusions, EPA can re-evaluate the ground water at this time.

Alternative GW1: No Action

Estimated Capital Cost:	$0
Estimated Annual O&M Cost:	$0
Estimated Present Worth:	$54,000
Estimated Construction Time:	None

CERCLA and the NCP require the evaluation of No Action as a baseline to which other alternatives are compared. No active remediation or containment of any contamination associated with the groundwater would be performed. However, this alternative would include five-year reviews of site data as required by CERCLA for sites where contamination remains after initiation of the remedial action.

Alternative GW2: Limited Action

Estimated Capital Cost:	$15,000
Estimated Annual O&M Cost:	$50,000
Estimated Present Worth:	$686,000
Estimated Construction Time:	6-12 months

This alternative consists of a long-term groundwater monitoring program and restrictions on groundwater use in the form of a Deed Notice or a Classification Exception Area (CEA). A monitoring program would be developed to ensure that risks resulting from on-site contamination do not increase. The monitoring program would include collecting samples from monitoring wells using low flow sampling techniques. Monitoring of sediment and surface water quality would also be incorporated into the long-term monitoring plan if it is established during the pre-design investigations that the groundwater is an ongoing source of contamination to sediments and/or surface water.

Periodic site inspections would be implemented to assess the potential migration of contaminants. CERCLA requires that if a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, EPA must review the action no less often than every five years after initiation of the action. Because contamination would be left in place under this alternative, a review of the remedy every five years would be required.

Alternative GW3: Containment

The FS report did not retain this groundwater alternative for a detailed evaluation as was done for the other three remedial alternatives since only a portion of the contaminated groundwater would be controlled and treated based on this alternative. Furthermore, extra costs would be incurred, in comparison to GW4, because of the cutoff wall construction specified for this alternative.

Alternative GW4: Restoration (Extraction Wells for Pump-and-Treat)

Estimated Capital Cost:	$3.455,000
Option (a) - Costs for Source Removal	$649.931,000
Estimated Annual O&M Cost:	$768,000
Estimated Present Worth:	$13.043,000
Estimated Construction Time:	1 year
Estimated Time to Achieve RAOs:	

Option (a) - Thousands of years (with source removal and restoration)

Option (b) - Cannot achieve RAOs (with no source removal and restoration)

This alternative includes groundwater restoration via extraction wells and a pump-and-treat system and a long-term monitoring program to assess the continuous operation of the treatment measures. Approximately 15 extraction wells would be installed in the vicinity of the Slag Area, along the Delaware River shoreline between Outfalls #4 and #7, and in the southeastern portion of the Site. The contaminated groundwater would be pumped at a combined rate of 93 gallons per minute (gpm) from both the upper and lower aquifers. The extracted contaminated groundwater would be collected in a storage tank and treated at an on-site treatment plant to meet the standards required for discharge to surface water or to a local Publicly Owned Treatment Works (POTW). The treatment system would include several process options for the removal of certain contaminants. Initially, chemical precipitation and filtration would be used to remove the inorganic compounds, followed by carbon adsorption for the removal of low-level organics. Two options are associated with this alternative: Option (a) - source removal and Option (b) - no source removal. Source removal consists of excavating all of the impacted soils from the main plant area and all of the material in the Slag Area, as described in Alternative SL-4. The groundwater modeling results indicate that it will take thousands of years for the lower aquifer to reach groundwater cleanup standards under Option (a) and groundwater cleanup standards would not be achieved under Option (b).

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EVALUATION OF ALTERNATIVES

Nine criteria are used to evaluate the different remediation alternatives individually and against each other in order to select an alternative. This section of the Proposed Plan profiles the relative performance of each alternative against the nine criteria, noting how it compares to the other options under consideration. In addition, the soils evaluation will include an analysis of the treatment component (stabilization) in the existing selected remedy for the Slag Area. The other components of the existing selected remedy for the Slag Area would remain the same. The nine evaluation criteria are discussed below. The "Detailed Analysis of Alternatives" can be found in the FS.

1. **Overall Protection of Human Health and the Environment**

SOILS

Alternatives SL3, SL4 and SA achieve the remedial action objectives of protecting human health and ecological receptors by preventing exposure to contaminated soil and slag. Alternatives SL4 and SA are more aggressive strategies than SL3. Alternative SL4 would achieve the remedial action objectives through complete removal of contaminated material, thereby providing the greatest protection of human health and the environment.

Alternative SA would achieve the remedial action objectives through treatment of hot spots and capping in the Slag Area, which the 1991 ROD cited as a source of the groundwater contamination. However, based on the Predesign Investigation Report (PIR) and the groundwater modeling effort, treatment of hot spots in the Slag Area would not necessarily reduce the leaching of contaminants into the groundwater because most of the groundwater contamination principally results from suspended particulates, and to a much lesser degree, as the result of leaching.

Alternative SL2 relies on institutional controls to improve overall protection of human heath and the environment, most of which are already in place. However, SL2 would not be protective of the environment as Alternatives SL3 or SL4 since it would not prevent the potential for contaminant migration and the potential of birds and small mammals from making direct contact with contaminated soils on-site. No remedial action objectives are achieved by Alternative SL1.

SEDIMENTS

Alternative SD3 achieves the remedial action objectives of protecting human health and ecological receptors by preventing exposure to contaminated sediments and restoring ecologically sensitive areas. Alternatives SD4 and SD5 would achieve the remedial action objectives through dredging and dewatering of contaminated sediments that would significantly reduce the toxicity, mobility or volume of contaminants in the sediments. The sediments are disposed of off-site and on-site under Alternatives SD4 and SD5, respectively. Alternative SD2 relies on institutional controls to improve overall protection of human heath and ecological receptors. However, SD2 would not protect ecological receptors from exposure to contaminated sediment. No remedial action objectives are achieved by Alternative SD1.

GROUNDWATER

Alternative GW4 would achieve the remedial action objectives by extraction and treatment of the groundwater and would be protective of human health and the environment. Also, by using Option (a) with GW4 to remove contaminated sources, the remedial action objectives would be further achieved by preventing direct contact with and exposure to the soils and slag material.

However, Alternative GW4 (Option a) would not provide a significant increase in protectiveness until the cleanup levels are reached, estimated to take thousands of years. Alternative GW2 relies on institutional controls to improve overall protection of human health by providing control of the exposure pathway. Alternative GW2 would not mitigate the ecological risks associated with groundwater. However, analysis of the current site conditions indicate that the metals may be migrating from soils to sporadically located areas of the groundwater, but the subsequent groundwater transport of metals to the surface water appears to be limited. Additionally, historical data show sediments were impacted predominantly from outfall discharges and there is no definitive evidence that ecological impacts resulted from contaminated groundwater discharging to the Delaware River. Alternative GW2 would include long-term monitoring of sediments and surface water to determine if groundwater is causing unacceptable impacts. No remedial action objectives are achieved by Alternative GW1.

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EVALUATION CRITERIA FOR SUPERFUND REMEDIAL ALTERNATIVES
Overall Protectiveness of Human Health and the Environment determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
Compliance with ARARs evaluates whether the alternative meets Federal and State environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.
Long-term Effectiveness and Permanence considers the ability of an alternative to maintain protection of human health and the environment over time.
Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.
Short-term Effectiveness considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.
Implementability considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.
Cost includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.
State/Support Agency Acceptance considers whether the State agrees with the EPA's analyses and recommendations, as described in the RI/FS and Proposed Plan.
Community Acceptance considers whether the local community agrees with EPA's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

2. **Compliance with ARARs**

SOILS

Alternative SL4 would meet chemical-specific TBCs, such as EPA SSLs and NJDEP Soil Cleanup Criteria, through removal, and Alternative SA would partially achieve chemical-specific TBCs through treatment. Alternative SL3 would not achieve chemical-specific TBCs, however, would provide protection through containment. Alternatives SL1 and SL2 would not achieve chemical-specific TBCs. Alternatives SL3, SL4 and SA would meet location-specific ARARs. All alternatives would comply with RCRA and related state regulations applicable to the technologies being utilized. A complete list of ARARs may be found in Section 2 of the FS report.

SEDIMENTS

Alternatives SD4 and SD5 would most aggressively meet chemical-specific TBCs, followed by Alternative SD3. Alternatives SD1 and SD2 would not achieve chemical-specific TBCs. All alternatives would be expected to comply with federal and state location-specific ARARs that regulate excavation, filling, and discharge into wetlands and floodplains. All alternatives would be expected to comply with RCRA and related state regulations applicable to the technologies being utilized. A complete list of ARARs/TBCs may be found in Section 2 of the FS report.

GROUNDWATER

Alternative GW4 attempts to achieve compliance with chemical-specific ARARs since the contaminated groundwater would be removed and treated, however it would take thousands of years and it is not clear whether the goal to achieve ARARs can even be met. In addition, GW4 would meet location- and action-specific ARARs, such as wetlands or discharge limits. Alternative GW1 and GW2 would not achieve compliance with chemical-specific ARARs since contaminants are not removed to cleanup levels, however Alternative GW2 would achieve compliance with location- and action specific ARARs.

3. **Long-term Effectiveness and Permanence**

SOILS

Alternative SL4 uses source removal for contaminated soils and slag, which is a complete and permanent means of preventing direct contact exposure. Alternative SL3 would effectively minimize the public exposure by using soil and asphalt capping, such that long-term performance of the soil and asphalt caps could be maximized by proper maintenance, inspection and monitoring. Alternatives SL1 and SL2 do not include any measures for containing or treating the contaminated soils, and the control measures are not considered reliable in the long-term. The magnitude of residual risks are significantly reduced for Alternative SL4 through removal and Alternative SA through on-site treatment,

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considerably reduced for Alternative SL3 through containment, and highest for Alternatives SL1 and SL2.

Under Alternative SA, long-term permanence is further enhanced by removing contaminants from the slag material to acceptable levels through stabilization, however treatability studies would be necessary to ensure contamination could be reduced to acceptable levels. Even though unanticipated, some inorganic leaching may occur if the stabilized slag material matrix deteriorates. This alternative may offer slightly more protection by stabilizing a portion of the slag material, however, this alternative would not impact the migration pathway of suspended particulates from untreated slag material below the water table. Considerable confirmatory sampling would be necessary to ensure that all the hot spot slag material was excavated for treatment, and as a result, the volume of hot spot material may increase beyond the design limits.

SEDIMENTS

Alternatives SD4 and SD5 eliminates the risk associated with contaminated material from the sediments through dredging, disposal and restored with placement of sandy loam soil. Under Alternative SD5, sampling of the dredged sediments would be performed to assure for safe on-site disposal. Alternative SD3 uses capping of contaminated sediments, which is effective means of preventing exposure, but would be subject to erosion and therefore may not be as effective over the long-term. Alternatives SD1 and SD2 do not include any measures for containing or dredging the contaminated sediments, and the control measures are not considered reliable in the long-term. The magnitude of residual risks are significantly reduced for Alternatives SD4 and SD5, and highest for Alternatives SD1, SD2 and SD3.

GROUNDWATER

Alternative GW4 extracts and treats the contaminated groundwater, thereby eliminating a larger volume of the contaminants. By employing Option (a) as part of GW4, long-term effectiveness would also be achieved, since the source areas would be removed permanently from the Site. However, reduction of contaminant concentrations in the groundwater would not be obtained within a reasonable time frame due to the significant difficulty in extracting the inorganics from the aquifer. Alternative GW2 relies on water use restrictions as control measures and long-term monitoring to ensure protectiveness of the ecological systems. All alternatives would include periodic five-year reviews. The magnitude of residual risk is highest for Alternatives GW1, GW2 and significantly reduced for Alternative GW4 over an unreasonable time frame.

4. **Reduction of Toxicity, Mobility, or Volume of Contaminants Through Treatment**

SOILS

The greatest reduction of toxicity, mobility, and volume of contaminants would be achieved by Alternative SL4 where the soil and slag material are entirely removed from the Site. Alternative SL3 reduces mobility of the contaminants by minimizing erosion and infiltration of rainfall, thereby reducing the quantity of water percolating through the soils and slag material. The contours of the cap and the stormwater management system would minimize ponding and promote efficient runoff of stormwater. Alternative SA also reduces mobility of contaminants in a portion of the Slag Area through treatment and does not generate treatment residues. This alternative would not directly affect the intrinsic toxicity and would increase the volume of the treated slag material. Alternatives SL1 and SL2 provide no reduction in the toxicity, mobility, or volume of contaminants in the soils.

SEDIMENTS

The greatest reduction of toxicity, mobility, and volume of contaminants would be achieved by Alternatives SD4 and SD5, where contaminated sediments are removed through dredging and disposed of either off-site or on-site, respectively. Alternatives SD4 and SD5 would similarly reduce the mobility and volume of contaminants that may impact ecological sensitive areas. For Alternative SD5, the low-level contaminated sediments would be placed on-site and capped to prevent direct contact. Alternative SD3 reduces the mobility of the contaminants by capping the sediments. The cap would have to be properly maintained to assure the protectiveness of this alternative. Alternatives SD1 and SD2 provide no reduction in the toxicity, mobility, or volume of contaminants in the sediments.

GROUNDWATER

Alternative GW4 would attempt to reduce toxicity, mobility, and volume of the contaminants via removal and the groundwater treatment system, however this would occur over an unreasonable time-frame. If Option (a) is used in conjunction with GW4, then the toxicity, mobility and volume of soil contamination would also be reduced through source removal. Alternatives GW1 and GW2 provide no reduction in the toxicity, mobility or volume of contaminants at the Site. However, analysis of the current site conditions indicate that the metals may be migrating from soils to sporadically located areas of the groundwater, but the subsequent groundwater transport of metals to the surface water appears to be limited.

5. **Short-term Effectiveness**

SOILS

Potential risks to workers associated with the disturbance of the site soils and slag material would be mitigated through the use of established safe-work practices and appropriate personal protective equipment. Potential risks to workers would be negligible for Alternatives SL1 and SL2, slightly greater for Alternative SL3, and greatest for Alternative SL4 associated with the major earthmoving activities. The increasing potential impact would be created through increased construction activity and increased exposure due to larger volumes of contaminated material excavated and handled. These risks would be minimized by using appropriate dust suppression measures. Alternative SA could create some additional low-level particulate emissions from the on-site treatment operations. Monitoring would be used to ensure that no airborne contamination migrates from the Site. Off-site impacts to the neighboring community would include possible dust emissions and truck traffic associated with heavy construction activities and the transport of materials on-site and off-site. For Alternative SL4, clearing, trenching, and source removal would impact wildlife habitats for a brief time; however, these areas would be restored as part of the remediation.

Alternatives SL3, SL4 and SA would achieve remedial action objectives, and could be implemented in the following time-frames. The time-frame for SL4 is based the availability of off-site disposal facilities willing to accept excessive volumes of soil and slag material. Alternatives SL1 and SL2 could be implemented within several months, however they would not achieve remedial action objectives.

Alternative SL1 - no construction time
Alternative SL2 - 6-12 months
Alternative SL3 - 1-2 years
Alternative SL4 - 2-3 years
Alternative SA - 2-3 years

SEDIMENTS

Potential risks to workers would be negligible for Alternatives SD1 and SD2, slightly greater for Alternatives SD3, and greatest for Alternatives SD4 and SL5. The increasing potential impact would be created through increased construction activity and increased exposure due to larger volumes of contaminated material dredged and handled. These risks would be minimized by using appropriate engineering controls, personal protective equipment, and safe work practices. Alternative SD4 would increase truck traffic due to hauling of contaminated sediments off-site and clean fill material on-site. For Alternatives SD3 through SD5, dredging would impact wildlife habitats for a brief time; however, these areas would be restored as part of the remediation.

Alternatives SD4 and SD5 would achieve remedial action objectives, and could be implemented in an estimated two to three years. Alternative SD3 is expected to require two years to complete. Alternatives SD1 and SD2 could be implemented within several months, however they would not achieve remedial action objectives.

Alternative SD1 - no construction time
Alternative SD2 - 6-12 months
Alternative SD3 - 2 years
Alternative SD4 - 2-3 years
Alternative SD5 - 2-3 years

GROUNDWATER

Potential risks to workers would be negligible for Alternatives GW1 and GW2, and the greatest for Alternative GW4. The increased potential impact to workers and area residents for Alternative GW4 would be created through increased construction activity and increased exposure to contaminated groundwater associated with the on-site treatment processes. These risks would be minimized by using appropriate engineering controls, personal protective equipment, and safe work practices. Alternative GW4 would increase truck traffic due to hauling of contaminated soil and slag material off-site and clean fill material on-site associated with Option (a). For Alternative GW4, clearing, trenching, and source removal would impact wildlife habitats for a brief time; however, these areas would be restored as part of the remediation.

Alternative GW4 would achieve remedial action objectives over a period of thousands of years, and could be constructed within one year. Alternatives GW1 and

GW2 could be implemented within several months, however they would not achieve remedial action objectives.

Alternative GW1	-	no construction time
Alternative GW2	-	6-12 months
Alternative GW4	-	1 year (construction time)
(Option a)	-	Thousands of years (time to achieve RAOs)

6. **Implementability**

SOILS

Alternatives SL1 through SL4 are technically and administratively feasible. In general, no major construction concerns are associated with any of the alternatives. Services and materials for all alternatives are readily available. However, the availability of off-site disposal facilities willing to accept excessive volumes of soil and slag material and the availability of excessive volumes of clean backfill to restore the area associated with Alternative SL4 may be limited. Additionally with Alternative SL4, it may be difficult to control the water table or river water encountered during excavations throughout the Site. This may involve pumping water from excavations or dewatering soils from the deeper excavations.

Alternative SA uses a treatment technology, in which treatability studies would need to occur during the design phase to optimize operating parameters. Extensive analyses would need to be performed to determine the implementation parameters for this alternative. The stabilization of soil contaminated with metals is an easily implemented and proven technology. However, the stabilization of hot spot areas would be technically difficult due to the massive volume and the physical nature of material requiring treatment. Excavating and backfilling a large volume of slag fill for treatment would be technically difficult because of the close proximity of the water table and river water, as discussed above. Alternative SA would require pretreatment processing (crushing, sorting, and screening) of large chunks of slag, iron deposited piles, and other debris, to ensure the slag material is suitable to undergo stabilization. Because of the large land area, the pretreatment process could be a fairly substantial activity.

SEDIMENTS

For Alternatives SD1 and SD2, no constructability concerns exist. Services and materials for all alternatives are readily available, as are appropriate off-site disposal facilities. Alternative SD3 would require careful construction to effectively place the cap and vegetation so as to prevent erosion. Alternative SD4 would have requirements for the transporting of waste off-site. Alternatives SD3 through SD5 would have to meet substantive requirements for dredging of sediments.

GROUNDWATER

Alternative GW4 uses demonstrated and proven treatment technologies. Some engineering studies would need to occur during the design phase to optimize operating parameters. The availability of off-site disposal facilities willing to accept excessive volumes of soil and slag material associated with Option (a) may be limited. For Alternatives GW1 and GW2, no constructability concerns exist. All of the alternatives would include periodic reviews and inspection as a means of monitoring the effectiveness of the remedy.

7. **Cost**

SOILS

The estimated present worth costs range from $54,000 for Alternative SL1 to $649,931,000 for Alternative SL4. In evaluating cost effectiveness between Alternatives SL3, SL4 and SA, Alternative SL3 ($20,479,000 - 24,422,000) is the most cost effective, as it satisfies the remedial action objectives at the least cost, and removes the risks associated with the potential exposure to contaminated soil. Both Alternatives SL4 and SA are inordinately high costing alternatives that are more protective since the contaminants would be removed from the Site or made unavailable through treatment. Alternative SL1 is the lowest cost but provides no additional protection of human health and the environment. Alternative SL2 is the next lowest cost alternative and provides minimal reduction of risk to human health and no protection of the environment. The present-worth costs are as follows:

Alternative SL1	-	$54,000 (5-year reviews)
Alternative SL2	-	$5,869,000
Alternative SL3	-	$24,422,000 (Option a)
		$20,479,000 (Option b)
Alternative SL4	-	$649,931,000
Alternative SA	-	$66,146,000 (1997 cost estimate)

SEDIMENTS

The estimated present worth costs range from $54,000 for Alternative SD1 to $19.279,000 for Alternative SD4. In

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evaluating cost effectiveness between Alternatives SD3 through SD5, Alternative SD5 ($11,354,000) is the most cost effective alternative that satisfies the remedial action objectives by preventing exposure to contaminated sediments and restoring ecological sensitive areas. Alternative SD3 would be more cost effective than Alternative SD5, however effectiveness in the long-term would have to be demonstrated. Alternative SD1 is the lowest cost but provides no additional protection of human health and the environment. Alternative SD2 is the next lowest cost alternative and provides minimal reduction of risk to human health and no protection of the environment.

Alternative SD1 - $54,000
Alternative SD2 - $656,000
Alternative SD3 - $5,144,000
Alternative SD4 - $19,279,000
Alternative SD5 - $11,354,000

GROUNDWATER

The estimated present worth costs range from $54,000 for Alternative GW1 to $13,043,000 for Alternative GW4. In evaluating cost effectiveness between Alternatives GW2 and GW4, Alternative GW2 ($686,000) is the most cost effective alternative that satisfies the remedial action objectives by preventing human exposure to contaminated groundwater and monitoring ecological sensitive areas. Alternative GW4 (Option a) would take thousands of years to satisfy the remedial action objectives; thus the increased cost would be unwarranted. Additionally, the cost of complete source removal, which is critical to the success of complete groundwater restoration, is inordinately high ($649,931,000) and not cost effective.

Alternative GW1 - $54,000
Alternative GW2 - $686,000
Alternative GW4 - $13,043,000
(Option a) - $649,931,000 (Additional Costs for Source Removal)

8. **State/Support Agency Acceptance**

The State of New Jersey supports the preferred alternative in this Proposed Plan.

9. **Community Acceptance**

Community acceptance of the preferred alternative will be evaluated after the public comment period ends and will be described in the Record of Decision, the document that formalizes the selection of the remedy, for the site.

SUMMARY OF THE PREFERRED ALTERNATIVE

Based upon an evaluation of the various alternatives, EPA and NJDEP recommend Soil Alternative 3, Sediment Alternative 5 and Groundwater Alternative 2. EPA and NJDEP also recommend that the Existing Selected Remedy for the Slag Area (treatment of hot spots, and soil cap with stormwater management system and shoreline protection), as specified in the 1991 ROD, be changed to the Proposed Remedy for soil, SL3 (soil cap with stormwater management system and shoreline protection). The basis for the proposed changes to the Slag Area remedy is provided in the comparative analysis of the soil alternatives.

TECHNICAL IMPRACTICABILITY (TI) WAIVER

A technical impracticability (TI) waiver evaluation for the attainment of groundwater chemical-specific ARARs/TBCs (GWQC and MCLs) was prepared and is included as Appendix E of the Feasibility Study. The TI waiver justification was based on the extremely long time required to achieve groundwater ARARs, the large volume of groundwater to be remediated, the high cost of Alternative GW4, and the extreme difficulty in extracting the inorganics from the aquifer. The TI waiver pertains to the site-wide contaminated groundwater.

Based on historical RI data, current site conditions, the preliminary design of the treatment system, and the contaminant modeling performed as part of the FS, the factors that warranted the decision to declare groundwater restoration as technically impracticable include:

- The thousands of years required to remediate the 1.7 trillion gallons of contaminated groundwater;
- The high present worth cost of $13,043,000 for groundwater restoration (for the first 30 years);
- The significant difficulty in extracting inorganics from the aquifer due to the high level of contaminant sorption and locking into soil;
- The large 200-acre (8.7 million ft^2) spatial area of site-wide contamination;
- The replacement of the treatment system every 30 years of a remediation period lasting thousands of years, based on the typical design life of equipment; and
- The inability to achieve groundwater chemical-specific ARARs or target cleanup levels in a reasonable time-frame.

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A waiver from achieving NJ-GWQS is warranted. Additionally, source removal of site-wide soils and slag, above and below the water table, is critical to the success of complete groundwater restoration. An additional cost of $649,931,000 for source removal is inordinately high. The alternative strategy is the implementation of the Limited Action alternative(i.e., GW2) for groundwater, with long-term monitoring of sediments, surface water and groundwater to assess the potential for unacceptable ecological risks. The long-term monitoring program would be performed in accordance with a Long-Term Monitoring Plan, which would be developed using the Final OSWER Monitored Natural Attenuation Policy (USEPA, 1999), following adequate delineation of the groundwater contamination.

The Limited Action alternative (GW2) (i.e., use restrictions and a Classification Exception Area (CEA)) is protective of human health, since it provides control of the exposure pathway. This alternative would not mitigate ecological risks if the groundwater causes degradation in sediment quality and impacts to ecological systems. However, based on historical data that show sediments were impacted predominantly from outfall discharges, there is no definitive evidence that ecological impacts resulted from contaminated groundwater (discharging to the Delaware River). Monitoring of sediment and surface water quality would also be incorporated into the long-term monitoring plan if it is established during the pre-design investigations that the groundwater is an ongoing source of contamination to sediments and/or surface water.

The preferred groundwater alternative is based on the current data and is subject to change based on future data that may be collected and demonstrates differing conditions. Five-year reviews, as required by CERCLA, also serve to evaluate whether conditions differ sufficiently from those expected to merit a re-evaluation of alternatives.

The preferred alternative for soils includes site-wide capping of contaminated soils using soil only or a combination of soil/asphalt, and vegetation of the soil cap areas. The type of capping would be based on the physical characteristics of different portions of the Site and the future uses of each portion. The preferred alternative for sediments include dredging the contaminated sediments, dewatering the dredged sediments, on-site disposal, and site restoration. The preferred alternative for groundwater includes a long-term monitoring program and restrictions on groundwater use. Additionally, the Proposed Remedy for the Slag Area includes covering the entire 34-acre Slag Area with a soil cap and vegetation without prior treatment of hot spots, similar to the preferred alternative for soils. All alternatives would require long-term maintenance and monitoring of the capped and restored areas. Since contamination would remain on-site, institutional controls and five-year reviews would be required to be implemented to assess the potential migration of contaminants and the effectiveness of the remedy. If necessary, appropriate action would be considered at that time.

Alternatives SL3 (including the Proposed Remedy for the Slag Area), SD5 and GW2 eliminate the risk of exposure to human health and ecological receptors by containing the soils and slag material, dredging the sediments and monitoring the groundwater. Alternatives SL3 (including the Proposed Remedy for the Slag Area) and SD5 would comply with ARARs and satisfy the remedial action objectives at the least cost. Alternative GW2 would not achieve the groundwater chemical-specific ARARs. However, these ARARs would be waived based on the technical impracticability evaluation. The preferred alternatives, Alternatives SL3 (including the Proposed Remedy for the Slag Area), SD5 and GW2 , would provide the best balance of trade-offs among alternatives with respect to the evaluating criteria, and achieve cleanup objectives at less cost than the other options. EPA and the NJDEP believe that the preferred alternatives would be protective of human health and the environment, would comply with ARARs, would be cost effective, and would utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. The preferred alternatives would not meet the statutory preference for the selection of a remedy that involves treatment. Institutional controls would be implemented in the preferred soils and groundwater alternatives to prevent excavations through the cap and restrict future land and groundwater uses. The preferred alternatives can change in response to public comment or new information.

COMMUNITY PARTICIPATION

EPA and NJDEP provide information regarding the cleanup of the Roebling Steel Company Site to the public through public meetings, the Administrative Record file for the site, and announcements published in the Burlington County Times and the Bordentown Register News. EPA and the State encourage the public to gain a more comprehensive understanding of the site and the Superfund activities that have been conducted there. The dates for the public comment period, the date, location and time of the public meeting, and the locations of the Administrative Record files, are provided on the front page of this Proposed Plan. EPA Region 2 has designated a Regional Public Liaison Manager as a point-of-contact for community concerns and questions about the federal Superfund program in New York, New Jersey, Puerto Rico and the U.S. Virgin Islands. To support this effort, the Agency has established a 24-hour, toll-free number that the public can call to request information, express their concerns or register complaints about Superfund.

For further information on the Roebling Steel Company Site, please contact:

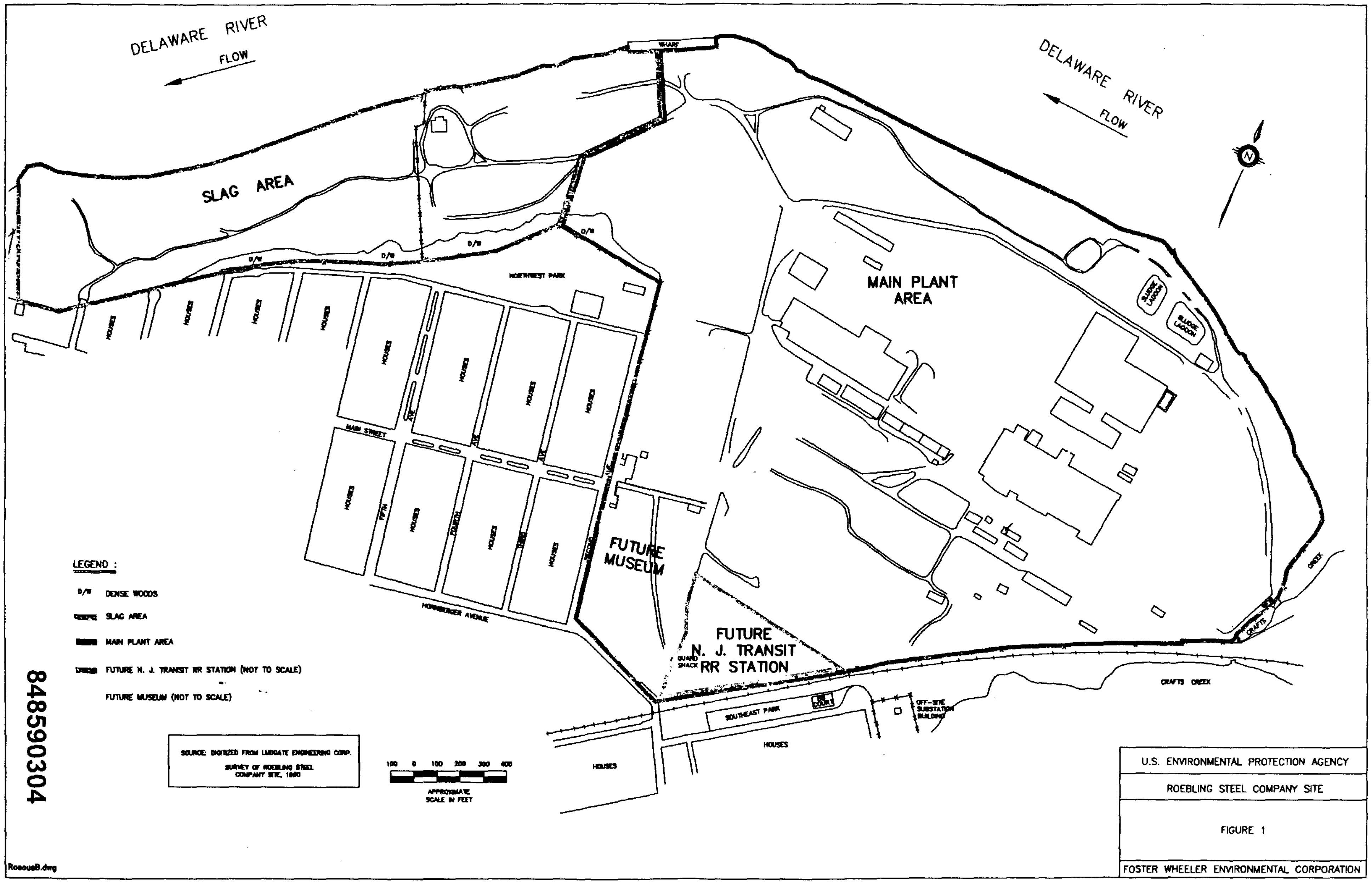
Tamara Rossi Remedial Project Manager (212) 637-4368	Pat Seppi Community Relations Coordinator (212) 637-3679

U.S. EPA
290 Broadway 19th Floor.
New York, New York 10007-1866

The Regional Public Liaison Manager for EPA's Region 2 office is:

George H. Zachos
Accelerated Cleanup Manager
Toll-free (888) 283-7626 or (732) 321-6621

U.S. EPA Region 2
2890 Woodbridge Avenues, MS-211
Edison, New Jersey 08837

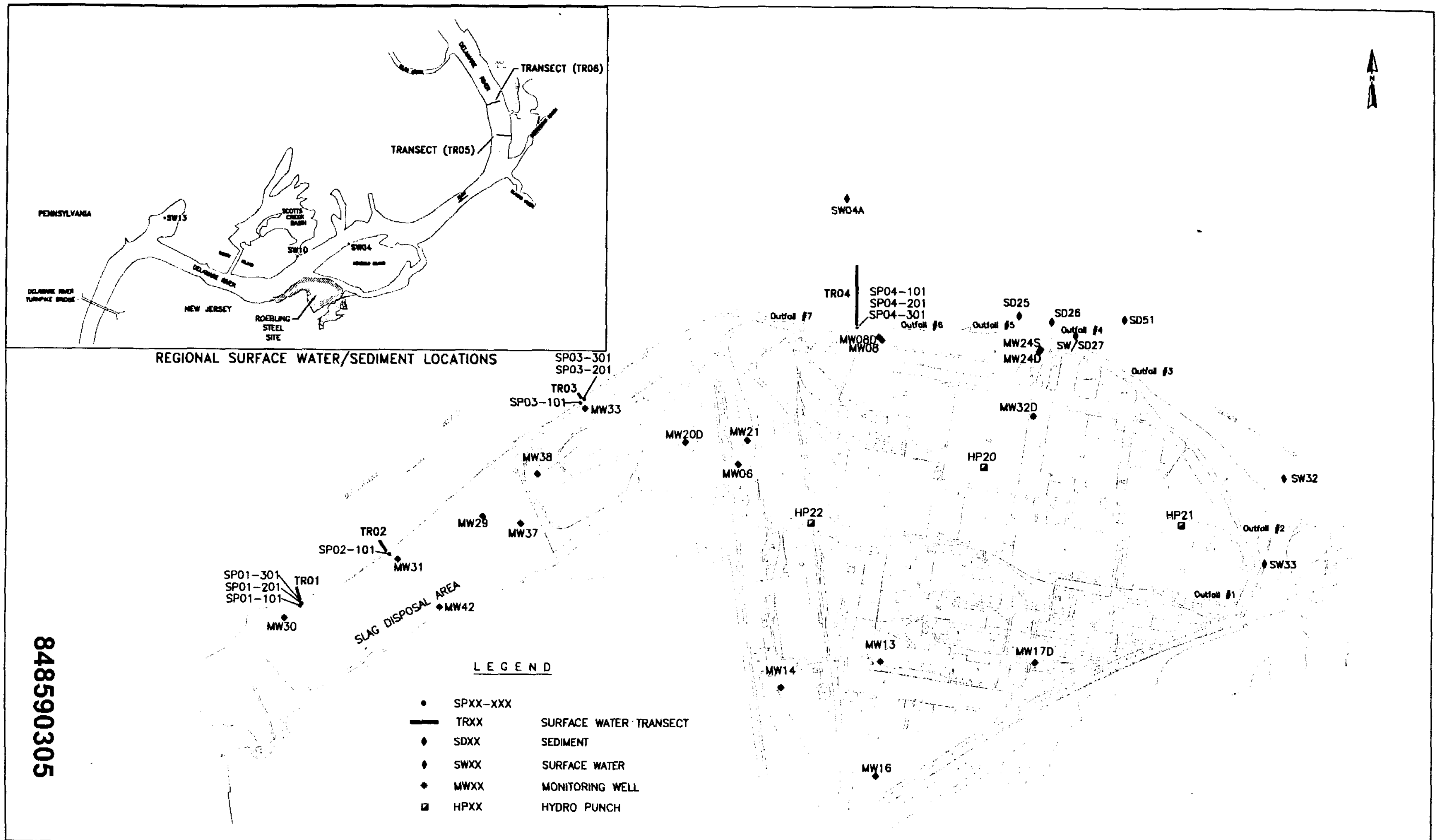


U.S. ENVIRONMENTAL PROTECTION AGENCY

ROEBLING STEEL COMPANY SITE

FIGURE 1

FOSTER WHEELER ENVIRONMENTAL CORPORATION



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U.S. ENVIRONMENTAL PROTECTION AGENCY
Roebling Steel Company Site

FIGURE 2

FOSTER WHEELER ENVIRONMENTAL CORPORATION

ATTACHMENT B

Responsiveness Summary

THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

announces a

PROPOSED PLAN (OU5), PROPOSED CHANGE TO REMEDY (OU3), AND PUBLIC COMMENT PERIOD

for the

ROEBLING STEEL COMPANY SUPERFUND SITE
BURLINGTON COUNTY, ROEBLING, NEW JERSEY

The U.S. Environmental Protection Agency (EPA) completed a Remedial Investigation/Feasibility Study (RI/FS) for OU5 of the Roebling Steel Company Superfund Site located in Roebling, New Jersey. Based on the work done at the site, EPA is announcing a proposed remedy for cleanup of OU5 which consists of contaminated soil, sediment, and groundwater at the site. EPA also proposes a change to the selected remedy for the slag area (OU3) identified in the September 1991 Record of Decision (ROD).

Before selecting final remedies or before changing selected remedies, EPA will consider written and oral comments on these Preferred Alternatives, as well as other alternatives that were considered. All comments must be received on or before September 19, 2003. EPA's ROD will include a summary of public comments and EPA responses.

EPA will conduct an informational public meeting on Thursday, August 28, 2003 at 7:00 p.m. at the Florence Township Municipal Building on 711 Broad Street in Florence, New Jersey. The purpose of this meeting is to discuss the findings of the RI/FS, present EPA's Preferred Alternatives for OU5, and discuss EPA's proposed changes to the OU3 Remedy.

EPA's RI/FS for OU5 evaluated the following remedial alternatives for cleanup of soil:

Alternative SL1: No Action
Alternative SL2: Limited Action
Alternative SL3: Containment
Alternative SL4: Source Removal/Off-Site Disposal

EPA's RI/FS for OU5 evaluated the following remedial alternatives for cleanup of sediment:

Alternative SD1: No Action
Alternative SD2: Limited Action
Alternative SD3: Containment
Alternative SD4: Dredging/Dewatering/Off-Site Disposal
Alternative SD5: Dredging/Dewatering/On-Site Disposal

EPA's RI/FS for OU5 evaluated the following remedial alternatives for cleanup of groundwater:

Alternative GW1: No Action
Alternative GW2: Limited Action
Alternative GW4: Restoration (Extraction Wells for Pump-and-Treat)

EPA's Preferred Alternatives for OU5 are Soil Alternative SL3, Sediment Alternative SD5, and Groundwater Alternative GW2. EPA recommends that the existing remedy for the slag area (OU3) as selected in the 1991 ROD be changed to the Preferred Soil Alternative for OU5 (Soil Alternative SL3 above).

All of the above-listed alternatives are outlined and discussed in the Proposed Plan.

The RI and FS reports, Proposed Plan, and other site-related documents are available for review at the following public information repositories:

Florence Township Library
1350 Hornberger Avenue
Roebling, New Jersey 08554
(609) 499-0143

Florence Township Municipal Building
711 Broad Street
Florence, New Jersey
(609) 499-2525

Written comments on the Preferred Alternatives for OU5 and the recommended changes to the OU3 Remedy, as well as any other alternatives considered should be sent to:

Tamara Rossi
Project Manager
U.S. Environmental Protection Agency, Region II
290 Broadway - 19th Floor
New York, New York 10007-1866
(212) 637-4368 or toll free 1-(800) 346-5009

Telephone inquiries may also be directed to:

Pat Seppi
Community Relations Coordinator
(212) 637-3679

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ATTACHMENT C

Responsiveness Summary

PLEASE PRINT

ROEBLING STEEL SUPERFUND SITE
SIGN IN SHEET

NAME	ADDRESS
1. Doug O'Malley	NJPIRG 11 N. Willow Trenton, NJ
2. Alex & Marion McDowall	60 Riverside Av Roebling, N.J. 08554 08600
3. Pierre Lacombe	435 E 3rd S Florence NJ
4. Simonne B. Gadbois	3 Tenth Ave Roebling NJ 08554
5. S. Vijayasundaram	NJ DEP Trenton, NJ.
6. Jill Monroe	NJDEP Trenton NJ
7. [illegible]	119 2nd Ave Roebling NJ 08554
8. Keith L. Crowell	74 Creekwood Dr. Bordentown, N.J. 08505
9. John Groze	1055 Yurcisin St, Roebling, NJ 08554
10. Vic Vittorini	600 Pennsylvania Av Delran, NJ 08075
11. [illegible]	717 Cooper St Florence, NJ 08518
12. John Tymash	761 2nd St
13. Jeanne Ashmore	242 Sixth Ave. Roebling N.J. 08554
14. Eleanor - John Hofflinger	114 - 6th Ave Roebling

Minutes to Diane Allen -

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NAME	ADDRESS
15. Elizabeth Ryan	4 Brookside Dr, Bordentown NJ 08505
16. Virginia L. Simon	1040 Potts Mill Rd, Bordentown NJ 08505
17. Carol K. Geary	228 E. 3rd St Florence NJ 08518
18. Jennifer Sneed 856-338-8922 (new office number)	One Port Center Suite 505 Fifth Floor 2 Riverside Drive Camden, NJ 08101
19. Michael Mechowski	1337 Maple Avenue Roebling, NJ 08554
20. Richard Brook	Florence Township Administrator
21. RON HUNSICKER	916 BROAD ST.
22. JAMES NAPOLITAN	13-2ND AVE ROEBLING, NJ
23. Nicholas J. DiLullo	416 E 4th St Florence NJ
24. Harold F Miller	16 4th AVE ROEBLING
25. Jean Slim Markatung	314 4th Ave Roebling
26. PAUL ORDOG	29-4th AVE, ROEBLING
27. Paul Carlow	443 N. Church, Moorestown
28. Tom McCue	130 4th AVE ROEBLING NJ
29. Carol Wessman	2 10th Ave Roebling
30. George Wessman	2 10th Ave Roebling
31. GARY E. OLAFF	205 E. 8TH ST. FLORENCE

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	Name	Address
32.	Vince Cipriano	408 E. 5th St Florence NJ 08518
33.	W. J. CUNNINGHAM	85 MAIN STREET ROEBLING NJ 08554
34.	Vanessa Lawson	26 mosshill Ln - Willingboro NJ 08046 (would like minutes)
35.	Diane L Schlagel	49 Second Ave Roebling NJ
36.	[illegible]	40 RIVERSIDE AVE
37.	George Sampson	926 Schisler Dr Florence
38.	M. A. NAPOLITAN	13 SECOND AVE ROEBLIN.
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APPENDIX VI

TECHNICAL IMPRACTICABILITY EVALUATION

TECHNICAL IMPRACTICABILITY EVALUATION
ALTERNATIVE GW4 GROUNDWATER RESTORATION:
EXTRACTION WELLS FOR PUMP-AND-TREAT

Purpose of Technical Impracticability Evaluation

This technical impracticability (TI) evaluation for the Roebling Steel Company Site (RSC), Operable Unit 5 (OU-5), is provided for the additional clarification of the TI aspects of Alternative GW4, Groundwater Restoration via Extraction Wells for Pump-and-Treat. The TI justification is based on the extremely long time required to remediate the site, the large volume of groundwater to be remediated, the high cost of Alternative GW4, and the extreme difficulty in extracting the inorganics from the aquifer. The TI waiver is being sought site-wide for the contaminated groundwater plume.

Site Background

The RSC is located on over 200 acres in Florence Township, Burlington County, New Jersey, in the vicinity of 40° 07' 25'' north latitude and 74° 46' 30'' west longitude. The site is located on the Bristol, PA 7.5 minute USGS topographic quadrangle map. West and southwest of the RSC, residential housing areas predominate. Most residential development adjacent to the site was constructed by the steel plant operators and used to house plant employees. The nearest residential dwellings to the site are approximately 100 feet from the property boundaries. A Penn Central (Conrail) track runs along the southeast boundary of the site. Areas on either side of this track are zoned for special manufacturing activities.

Newbold Island (New Jersey) lies in the Delaware River approximately 200 feet north of the site (see FS Report Figure 1-1). This island, owned by Public Service Electric and Gas Company, covers an area of approximately 500 acres and is largely undeveloped. The City of Burlington, located approximately six miles downstream from the site, uses the Delaware River for its water supply. The City obtains water both directly from the Delaware River and indirectly through shallow wells located on Burlington Island. The Delaware River also supplies water to the City of Philadelphia, farther downstream.

The RSC was actively used from 1906 to 1985 for various industrial purposes, but primarily for the fabrication of steel wire. The wire production process resulted in the generation of significant quantities of waste materials in both liquid and solid forms. The majority of liquid wastes were discharged to Crafts Creek and the Delaware River. Large quantities of solid wastes including slag, mill scale, used refractory materials and other production residues were disposed at the site. Numerous buildings, storage tanks and piping systems were abandoned at the site. On-site groundwater, as well as sediments in the Back Channel of the Delaware River, are contaminated with inorganics (e.g., heavy metals such as arsenic, beryllium and lead). As a result of on-site contamination, the site poses excess carcinogenic and non-carcinogenic risks primarily to individuals who may be present on the site for significant time periods.

TI Evaluation

This technical impracticability evaluation for the attainment of groundwater ARARs includes descriptions of: the site geology and hydrogeology; the development of conceptual and numerical groundwater flow models used to develop groundwater predictive simulations; the development of a contaminant transport model used to simulate current metals contamination in groundwater and predict future metals concentrations; the remediation potential of the site; and an economic assessment of Alternative GW4.

Geology and Hydrogeology

The RSC is underlain by a sequence of fill materials, sands, clays, silts, and gravels. These soils, excluding the fill material, appear to correlate to the Raritan or Magothy Formations of the Cretaceous Age which outcrop along the eastern bank of the Delaware River throughout much of southern New Jersey. These two formations are major aquifers of the Atlantic Coastal Plain in New Jersey.

Seventeen soil borings were drilled to install groundwater monitoring wells and to assess stratigraphy. The stratigraphy of the site consists of a shallow, unconfined Upper Aquifer and a confined Lower Aquifer. These two aquifers are separated in most parts of the site by a confining layer; the Upper Clay unit. However, the Upper Clay unit is not horizontally continuous across the entire site. In areas where this clay unit is absent, the two aquifers are hydraulically, as well as physically, connected.

Near the center of the site, a downward hydraulic gradient was observed through the Upper Clay unit. This is in agreement with regional data that show a general downward gradient from shallow to deeper aquifers in the area. However, at paired wells located near the Delaware River, and completed in the two sand units

(Upper and Lower, respectively), the potentiometric heads fluctuated such that the gradient varied over time with the flow upward at times and downward at others. This variability is likely due to tidal influences on water levels and the absence of a confining layer at these well locations resulting in the two layers acting as a single hydrologic unit where the clay layer is absent.

The metals of concern in the groundwater at the RSC are arsenic, beryllium and lead. Under a normal range of pH these metals are virtually immobile in groundwater. The metals prefer to partition to the solid portion of the aquifer instead of dissolving and moving with the groundwater. This relationship has been measured and is called the distribution coefficient (K_d) and is defined as the mass of solute on the solid phase per unit mass of solid phase divided by the concentration of solute in solution. The K_d can vary from zero to several thousand ml/g for the constituents of concern. Contaminants with values of K_d over 10 are basically immobile (Freeze and Cherry, 1979). The approximate K_ds for arsenic, beryllium and lead under the pH conditions at the site are 29 ml/g, 790 ml/g and 890 ml/g respectively. Therefore, these metals are basically immobile in the groundwater system. The values of the Kd for arsenic, beryllium and lead are adopted from Appendix A, Table 5 of Chapter 250 of Title 5, Environmental Protection of the Pennsylvania Code. This site is in the same physiographic region as Pennsylvania, which is just across the river from the site.

There is no specific site data for soil pH, clay content, organic carbon content, mineralogy or sulphate chemistry for the site. However, there are pH values for the groundwater at the site. The pH in the Upper Sand Aquifer ranges from 5.6 to 7.0; in the lower aquifer from 4.96 to 6.02, and in the slag area from 6.12 to 8.63. The pHs are in the neutral range in the slag area and the Upper Sand Aquifer and slightly acidic in the Lower Sand Aquifer. The limiting metal for cleanup is the lead which is in the upper aquifer and the slag area in a neutral pH zone. According to the EPA document "Understanding Variation in Partition Coefficient, Kd Values", Volume II, EPA 402-R-99-004B, August 1999, with equilibrium lead concentrations ranging between 37 and 187 ug/l and soil pH values ranging from 6 to 8, the values of Kd for lead range between 900 and 4970 ml/g. The value used in the model for the lead Kd was 890 ml/g which is the most conservative value of the range (shortest cleanup time) that is appropriate for the site.

Development of Conceptual and Numerical Groundwater Flow Models

A site-specific conceptual model (see Appendix D of this FS Report) was developed for the site. The conceptual model included the following three layers: the Upper Sand/Fill unit (Layer 1), the Upper Clay unit (Layer 2), and the Lower Sand unit (Layer 3). The conceptual model was used to develop a calibrated flow model for the site using the USGS MODFLOW 96 code. Using a variable-spacing grid, the entire model domain consisted of 37,638 discrete cells and 51,088 nodes. The model was successfully calibrated to previous groundwater elevation measurements at the RSC.

Development of a Contaminant Transport Model

A contaminant transport model was developed, using USGS MODPATH 96 and MT3DMS, to simulate the current metals contamination in the groundwater at the site and predict the metals concentrations in the future under natural attenuation and other various remediation scenarios. The flow field from the calibrated flow model was used for the transport modeling simulations.

The initial plumes were developed from measured exceedances in the monitoring wells at the RSC. The plumes included three lead and one arsenic plume in the Upper Sand Aquifer and one lead, one arsenic, and one beryllium plume in the Lower Sand Aquifer. The concentration used for each plume was the highest concentration from data from the RI Report.

Each plume is separate with boundaries extending from midpoints between the impacted monitoring well and adjacent monitoring wells in which the metal was not detected at a concentration above groundwater quality standards.

This base case transport model assumes that there is a continuing source of metals contamination and that it has not been removed. Constant mass loading concentrations were varied to determine the mass loading required to produce the concentrations that are currently observed in the Upper and Lower Aquifers, assuming a 50-year period of loading. The simulations were run for an additional 50 years to observe the predicted concentrations and plume geometry and to compare the results with the current plumes to determine concentration and geometry changes over the 50-year period. The modeling shows that with constant mass loading of arsenic, beryllium and lead, the concentrations in the plumes increase with time, but the plume geometry does not expand.

Additional transport modeling was performed simulating the plume concentrations over time for the following four scenarios: source removal and natural attenuation; source removal and active pump-and-treat; no source removal and active pump-and-treat; and no source removal and hydraulic containment, using a cutoff wall in conjunction with extraction wells.

Site Remediation Potential

Based on the groundwater flow and transport modeling, the following conclusions were developed regarding the site remediation potential:

- Under current conditions, with no source removal (i.e., No Action for soil and groundwater and no depletion of source material), the arsenic, beryllium and lead contaminant plumes will double in concentration but will not expand;
- If the sources are removed, the metals contaminant plumes would naturally attenuate under current groundwater flow conditions (via dilution and dispersion) in approximately 90,000 years;
- If the sources are removed, the metals contaminant plumes would be remediated in approximately 35,000 years if a pump-and-treat system were installed, at 93 gpm. The conceptual design includes 15 extraction wells, which are assumed to be fully penetrating in both Layer 1 and Layer 3. Seven of the 15 wells would extract a total of 23 gallons per minute (gpm) from Layer 1 and the remaining eight wells would extract 70 gpm from Layer 3. The combined pumping rate of 93 gpm would then be sent to a treatment system;
- If the sources are not removed, the metals contaminant plumes would never be remediated, even if a pump and treat system were installed;
- If the sources are not removed and hydraulic containment is achieved using a cutoff wall in conjunction with extraction wells, the metals contaminant plumes will never be remediated.
- Approximately 1.7 trillion gallons, of groundwater, over a 35,000-year period, would need to be remediated under the pump and treat scenario with source removal; and
- Extracting inorganics from the aquifer would be extremely difficult due to the high partition coefficient values of the controlling metals, such as lead (890 ml/g), arsenic (29 ml/g), and beryllium (790 ml/g).

Economic Assessment

The estimated construction cost for Alternative GW4 would be $3,455,000 and the annual O&M cost would be $768,000. Based on a seven-percent discount rate and a 30-year period, the total present worth of this alternative would be $13,043,000. An additional capital cost of $649,931,000 would also be incurred to remove source materials, since the groundwater modeling has demonstrated that the groundwater ARARs could only be achieved if sources are removed.

For the purpose of developing, evaluating, and comparing alternatives, a 30-year remediation time frame is typical. For Alternative GW4, with source removal, groundwater modeling suggests that the time frame to achieve ARARs would be approximately 35,000 years. A present worth analysis for a 35,000-year remediation period was performed using the following assumptions:

- The groundwater treatment system would need to be replaced every 30 years at a cost of $3,455,000 based on an estimated equipment design life;
- O&M costs would be $768,000 annually for the 35,000-year remediation time frame;
- Five-year reviews at a cost of $25,000 per review would be performed for the 35,000 year time frame; and,
- A seven percent discount rate is inclusive of inflation and return on investment.

Based on these assumptions, the net present worth analysis for the estimated 35,000-year remediation period results in a total present worth of $15,015,000. As anticipated, due to the time value of money and the extremely long time frame, the present worth analysis does not indicate a substantial cost differential beyond the 30-year analysis time frame.

TI Summary

Based on historical RI data, current site conditions, the preliminary design of the treatment system, and the contaminant modeling performed as part of the FS, the factors that warrant the decision to declare groundwater restoration as technically impracticable include:

- The 35,000-year period required to remediate the 1.7 trillion gallons of contaminated groundwater;
- The high present worth cost of $13,043,000 for groundwater restoration (for the first 30 years);
- The significant difficulty in extracting inorganics from the aquifer due to the high level of contaminant sorption and locking into soil;
- The large 200-acre (8.7 million ft^2) spatial area of site-wide contamination;
- The replacement of the treatment system every 30 years of the 35,000-year remediation period, based on the typical design life of equipment; and
- The inability to achieve groundwater ARARs or target cleanup levels in a reasonable timeframe.

Groundwater use restrictions would be required to be maintained until NJ-GWQS were achieved, and impacts to sediments, if any, would persist until concentrations were substantially reduced.

Alternative Remedial Strategy

As discussed previously, Alternative GW4 is not a viable strategy for achieving ARARs or remediating groundwater at the site within a reasonable timeframe. A waiver from achieving NJ-GWQS is warranted. In addition, aqueous plume remediation would require that all contaminant sources are removed. The alternative strategy is the implementation of the Limited Action alternative for groundwater, with long-term monitoring of sediments, surface water and groundwater to assess the potential for unacceptable ecological risks. The long-term monitoring program would be performed in accordance with a Long-Term Monitoring Plan, which would be developed in accordance with the Final OSWER Monitored Natural Attenuation Policy (USEPA, 1999), following adequate delineation of the groundwater plume.

The Limited Action alternative (i.e., use restrictions and a CEA) is protective of human health, since it provides control of the exposure pathway. This alternative would not mitigate ecological risks if the groundwater causes degradation in sediment quality and impacts to ecological systems. However, based on historical data that show sediments were impacted predominantly from outfall discharges, there is no definitive evidence that ecological impacts resulted from contaminated groundwater (discharging to the Delaware River). Monitoring of sediments and surface water could be performed to determine if groundwater is causing unacceptable ecological impacts. Should potential "triggers" signal that the selected remedy is not performing satisfactorily, a re-evaluation of options and the development of an alternative strategy to mitigate these impacts would need to be performed. The criteria (USEPA, 1999) that signal unacceptable performance of the selected remedy and indicate when to implement contingency measures, include:

- Contaminant concentrations in groundwater at specified locations exhibit an increasing trend not originally predicted during remedy selection;

- Future monitoring indicates unacceptable impacts to sediments or surface water;

- Near-source wells exhibit large concentration increases indicative of a new or renewed release;

- Contaminants are identified in monitoring wells located outside of the original plume boundary;

- Contaminant concentrations are not decreasing at a sufficiently rapid rate to meet the remediation objectives; and

- Changes in groundwater use will adversely affect the protectiveness of the remedy.

The alternative remedy is based on the current data and is subject to change based on future data that may be collected and demonstrates differing conditions. Five-year reviews, as required by CERCLA, also serve to evaluate whether conditions differ sufficiently from those expected to merit a re-evaluation of alternatives.